

Procedures and Technical Points for System Installation

SANYO

The following is instead for the installer responsible for installation of this air conditioning system, and should be carefully read before beginning.

Applicable models: SGP-M2 model outdoor unit

New Refrigerant R410A

- In addition, the following instruction documents are attached for the outdoor units : “Procedures and technical Points for Electrical Wiring Work (Outdoors),” and “Procedures and Technical Points for Test Run.” Be sure to refer to these documents.

IMPORTANT!

Please Read Before Starting

This air conditioning system meets strict safety and operating standard. As the installer or service person, it is an important part of your job to install or service the system so it operates safely and efficiently.

For safe installation and trouble-free operation, you must:

- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state, and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.



WARNING

This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.



CAUTION

This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

If Necessary, Get Help

These instructions are all you need for most installation sites and maintenance conditions. If you require help for a special problem, contact our sales/service outlet or your certified dealer for additional instructions.

In Case of Improper Installation

The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

WARNING When Wiring



ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY A QUALIFIED, EXPERIENCED ELECTRICIAN SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit all wiring and tubing are completed or reconnected and checked.

- Highly dangerous electrical voltage are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause **accidental injury or death**.
- **Ground the unit** following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.

When Transporting

Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut your fingers.

When Installing...

...In a Ceiling or Wall

Make sure the ceiling/wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.

...In a Room

Property insulate any tubing run inside a room to prevent “sweating” that can cause dripping and water damage to walls and floors.

...In Moist or Uneven Locations

Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

...In an Area with High Winds

Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

...In a Snowy Area (for Heat Pump-type Systems)

Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow vents.

When Connecting Refrigerant Tubing

- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them, then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

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When Servicing

- Turn the power OFF at the main power box (mains) before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

Gas Supply Pressure

Gas Supply	Pressure(mbar)		
	Min.	Normal	Max.
G20, G25 (Natural Gas)	17	20	25

Gas Supply	Pressure(mbar)		
	Min.	Normal	Max.
G31 (LPG)	25	37	45

Others



CAUTION

- Ventilate any enclosed areas when installing or testing the refrigeration system. Escaped refrigerant gas, on contact with fire or heat, can produce dangerously toxic gas.
- Confirm upon completing installation that no refrigerant gas is leaking. If escaped gas comes in contact with a stove, gas water heater, electric room heater or other heat source, it can produce dangerously toxic gas.

SAFETY PRECAUTIONS



WARNING

- Be sure to arrange installation from the dealer where the system was purchased or using a professional installer. If you attempt to perform the work yourself, and do so incorrectly, there is danger of poisoning caused by exhaust gases entering the building, as well as danger of water leakage, electric shock and fire.
- Installation work must be performed correctly, in accordance with the instructions listed here. Hazards from incorrect installation include dangerous exhaust gas buildup, water leakage, electric shock and fire.
- Check the type of engine fuel used. If the wrong type of gas is used, the engine can suffer combustion problems, and there is danger of poisoning caused by exhaust gases.
- Ventilate the area in case refrigerant gas leaks during installation work. If refrigerant gas comes into contact with frame during the tube brazing process, toxic gas will be produced.
- When installation work is completed, check that there is no refrigerant gas leakage. If refrigerant gas leaks into the room and contacts the frame of a fan heater, stove, burner, or other device, toxic gases will be produced.
- Never use refrigerants other than the one specified (written on label on the unit).
- When installing or moving the A/C unit, do not allow refrigerants other than the one specified (written on the label on the unit) or air to enter the unit's refrigeration cycle.
- Always use nitrogen for the airtightness test. (Do not use oxygen-based gases.)



CAUTION

- When handling refrigerant gas, do not come in contact with the gas directly. Doing so may result in frostbite.
- Check that all provided parts are present.

Provided documents:

- Remote power switch label
- Label showing the actual length of refrigerant tubing and amount of refrigerant charge
- Seal labels
- This manual ("Procedures and Technical Points for System Installation")
- "Procedures and Technical Points for Test Run"
- "Procedures and Technical Points for Electrical Wiring Work (Outdoors)"

1. SELECTING THE INSTALLATION LOCATION

(1) Install the gas heat pump A/C so that it satisfies all local regulations and government safety codes, as well as installation standards and service guidelines for industrial gas devices.

(2) Choose a suitable installation location (with adequate space for servicing), as below.



WARNING

- Install the outdoor unit in a location where exhaust gases will not enter the building's air intake or exhaust vents or windows, and will not enter the building through tubes or vents that lead inside the building. There is danger of poisoning if exhaust gases enter the building.
- Install the outdoor unit outdoors, in a location open to the air, so that there is no accumulation of exhaust gases. There is danger of the gases entering the building and causing poisoning.
- The exhaust gases must be open to the air in a location where they will not adversely affect the surroundings. There is danger of exhaust gases entering the building and causing poisoning. (Be certain not to allow exhaust gases to be discharged into a drainage basin, gutter, or similar location.)
- Install the outdoor unit securely in a location that can fully bear the weight of the unit. There is danger of gas leakage or injury if the outdoor unit tips over or falls.



CAUTION

- The allowances shown in Fig. 1 are for the space required for maintenance work. Be sure to provide this minimum space when selecting the location of the unit. Failure to do so may result in injury caused by the outdoor unit tipping over during maintenance, or in difficulty in servicing the unit.
- If the outdoor unit is installed on a roof or other elevated location, install a permanent ladder, handrails, and other necessary items in the passageway leading up to the unit, and install a fence, handrails, or similar structure around the outdoor unit. Failure to do so may result in injury caused by the unit tipping over during maintenance.
- Be sure to stand on a stable surface when installing the outdoor unit on an elevated base or location, and avoid using stepladders.
- Leave the distances shown in Fig. 2 between the outdoor unit and any flammable materials. There is danger of fire if these distances are insufficient.
- Do not install the outdoor unit in a location where flammable gases may be generated, flow, accumulate or leak, or in a location where volatile substances are handled or stored. There may be danger of fire or explosion if the unit is installed in such a location.
- Install the outdoor unit in a location where exhaust gases and fan air will not harm plants or animals. The exhaust gases and fan air may adversely affect plants and animals.
- Avoid installation near locations such as parking lots and flowerbeds where damage from clinging dust and particles may occur. If installation in such locations is unavoidable, be sure to put a covering on the outdoor unit or take other measures to protect it.
- In addition to heeding the WARNING and CAUTION notes, avoid installation in locations where the unit will be exposed to the following:
 - excessive dust
 - excessively salty air, such as near the sea
 - sulfuric gases, such as near hot springs
 - excessive water, vapors, or oil fumes (ex: from machines)
 - fumes from organic solvents
 - high fluctuations in power voltage
 - electromagnetic interference from other devices
- In order to improve heat exchange, install the outdoor unit in a location that is well ventilated. The spaces for each part must be as shown in Figs. 1 and 2. If installing in a poorly ventilated location, or if installing multiple outdoor units, ensure sufficient space to prevent short circuits.

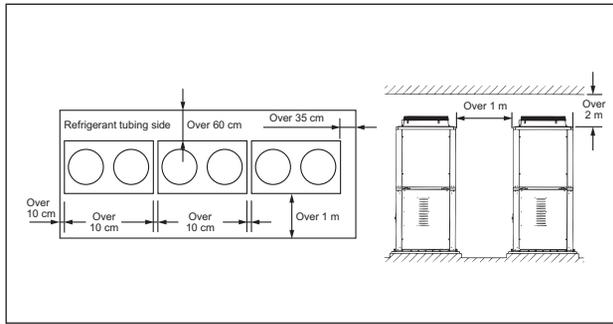


Fig. 1

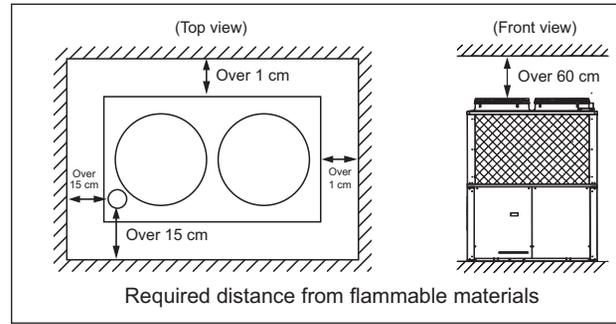


Fig. 2

- (3) In snowy regions, be sure to install a snow-protection hood and enclosure.
Even in regions that do not have heavy snowfall, install a snow-protection roof (such as a snow hood) if the unit is installed in a location where snow may build up and fall from the building's roof or other surface onto the unit. (Install the hood so that the coolant supply opening at the top of the unit can be used.)
- (4) Take care that operating noise and exhaust do not disturb neighboring buildings or homes.
In particular, install so that noise-related local environmental standards, if any, are satisfied at the border with a neighboring dwelling.
- (5) Electrical noise resulting from this gas heat pump A/C may affect other electrical devices. When installing and wiring, take care to leave sufficient space (3 m or more) between the A/C units (indoor and outdoor units) - or the power cables - and any other units, antennas, signal cables, or power cords of televisions, radios, stereos, intercoms, computers, word processors, telephones, and similar devices.
- (6) Select an installation location so that the length of refrigerant tubing is within the ranges shown in the table below.

Table 1 Ranges for Refrigerant Tubing Length and Installation Height Difference

Category	Symbol	Description	Tubing length (m)
Allowable tubing length	L1	Max. allowable tubing length	≤170 (equivalent length 200)
	$\Delta L=(L2-L4)$	Difference between longest and shortest tubing lengths after the No. 1 branch (first branching point)	≤40
	LM ^{(*)1}	Max. length for main tube (tube with widest diameter)	≤120
	ℓ1, ℓ2...ℓ48	Max. length for each tube branch	≤30
	L5 ^{(*)2}	Distance between outdoor units	≤10
Allowable height difference	H1	Max. height difference between indoor and outdoor units	If outdoor unit is above ≤50 If outdoor unit is below ≤35 ^{(*)3}
		H2	Max. height difference between indoor units
	H3 ^{(*)2}	Max. height difference between outdoor units	≤4
Allowable length for branched tubing (header branch)	L3	Max. length between first T-tee branch (provided by installer) and the closed tube end	≤2

- (*1) The minimum length for the main tubing is 7 m.
(*2) The maximum length for balance tubes is 10 m.
(*3) If cooling mode is expected to be used when the external temperature is 10°C or below, the maximum length is 30 m.

- The grouping of tubes that connect the outdoor units to the indoor units is referred to as the "main tubing."

When the maximum tubing length is more than 90 m (equivalent length), upgrade the tube size 1 rank for both the liquid and gas tubes of the main tubing.
The prescribed performance cannot be guaranteed if the wrong size is selected.

CAUTION

1. The precautions for use of the separately purchased branch tube () are included in the package with the part. Be sure to refer to them.
2. When using a T-tee branch tube (provided by installer) (only with L3 at 2 m or less), the main tubing must be either level or vertical. The openings of each branch tube must be at a raised angle from the ground when the main tubing is level. The openings can be set at any angle when the main tubing is vertical, but be sure to curve a portion of the connected tubing upward. Always close weld the end point of the T-tee tubing. In addition, pay special attention to the insertion dimensions for each connected tube so that refrigerant flow is not blocked at the T-tee branches. Be sure to use only standard T-tees.
3. Do not use commercially available Y-shape joints () for liquid tubing (for the branch tubing that is provided by the installer).

Outdoor and indoor units are connected together by a pair of headers.

If the maximum tubing length exceeds 90 m (effective length), increase the size of the main tubing for both liquid and gas by one size. Be careful when selecting tube sizes, as the wrong size may impair performance.

Table 2 Outdoor Tubing / Main Tube Sizes (*1) (*2)

	Total allowable capacity of connected outdoor units (kW)				
	35.5	45	71	101	Over 101
Gas tube (mm)	φ25.4 (φ28.58)	φ28.58 (φ31.75)		φ31.75 (φ38.1)	φ38.1
Liquid tube (mm)	φ12.7 (φ15.88)		φ15.88 (φ19.05)	φ19.05 (φ22.22)	
Balance tube (mm)	—		φ9.52 (*3)	φ9.52	

- (*1) If anticipating future expansion, select tube diameters according to total capacity after expansion.
- (*2) If the maximum tubing length exceeds 90 m (equivalent length), increase the diameter of the main tubing to the size in () for both liquid and gas tubes. However, gas tube diameter should not exceed 38.1 mm. (Reducers are available locally.)
- (*3) For systems with two type 35.5 kW.

Table 3 Size of main tubing after branch (*1) (*2)

	Capacity of indoor units after branch (kW) (*3)								
	~ 5.6	~ 16.0	~ 22.4	~ 28.0	~ 35.5	~ 45.0	~ 72.8	~ 101.0	Over 101.0
Gas tube (mm)	φ12.7	φ15.88	φ19.05 (φ22.22)	φ22.22 (φ25.4)	φ25.4 (φ28.58)	φ28.58 (φ31.75)		φ31.75 (φ38.1)	φ38.1
Liquid tube (mm)	φ6.35	φ9.52 (φ12.7)			φ12.7 (φ15.88)		φ15.88 (φ19.05)	φ19.05 (φ22.22)	

- (*1) Select a diameter for the main tubing after a branch that is no larger than that of the header. (In cases where the main tubing after a branch would have to be larger than the header tubing, select tubing of the same size, and never exceed the header size.)
- (*2) If the maximum tubing length exceeds 90 m (equivalent length), increase the diameter of the main tubing after the branch to that indicated within the parenthesis for both liquid and gas tubes. However, gas tube diameter should not exceed 38.1 mm.
- (*3) In this table, “~ XX” means “XX kW or below.”

Table 4 Branch/Header Tube Selection

Use the following branch tubing sets or tubing sets for branching the system's main tube and indoor unit tubing.

	Branch tube size ^(*1)		Branch tube number		
	Gas tube (mm)	Liquid tube (mm)	Branch tubing		
			APR-P160BG	APR-P680BG	APR-P1350BG
Over 72.8 kW	φ31.75	φ19.05	—	—	•
Over 45.0 kW to 72.8 kW	φ28.58	φ15.88	—	•	•
Over 35.5 kW to 45.0 kW	φ28.58	φ12.7	—	•	•
Over 28.0 kW to 35.5 kW	φ25.4	φ12.7	—	•	•
Over 22.4 kW to 28.0 kW	φ22.22	φ 9.52	—	•	•
Over 16.0 kW to 22.4 kW	φ19.05	φ 9.52	•	•	•
Over 5.6 kW to 16.0 kW	φ15.88	φ 9.52	•	• ^(*3)	• ^(*3)
5.6 kW or below	φ12.7 ^(*2)	φ 9.52	•	• ^(*3)	• ^(*3)

- (*1) Make a selection so as not to exceed the main tubing size.
- (*2) Even when 5.6 kW or below, make the gas tube diameter φ15.88 if 2 or more indoor units are connected after branching.
- (*3) As the tube diameter for the supplied reducer does not match, another reducer must be provided by the installer.

Table 5 Tubes Connecting Outdoor Units and Indoor Units

Tubing connecting to outdoor units (tA to tB)	Unit type	35.5 kW	45.0 kW	56.0 kW	71.0 kW
Tube size	Gas tube (mm)	φ25.4	φ28.58		
	Liquid tube (mm)	φ12.7		φ15.88	
	Balance tube (mm)	φ9.52			

Tubing connecting to indoor units (t1 to t48)	Unit type	28	36	45	56	71	80	90	112	140	160	224	280
Tube size	Gas tube (mm)	φ12.7						φ15.88				φ22.22	φ25.4
	Liquid tube (mm)	φ6.35				φ9.52				φ12.7			

Note: Keep the maximum length between t1 to t48 within 30 m.

Gas trip-valve kit (SGP-VK32K)

As shown in Fig. 6, install the gas trip-valve kit between the outdoor unit and the refrigerant gas tube (wide) of the main tubing.

* Refer to "7. USING A VIBRATION-RESISTANT FRAME" when using a vibration-resistant frame.

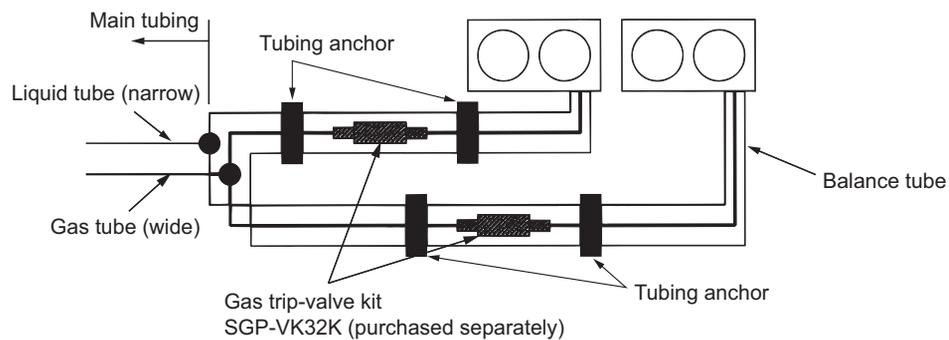


Fig. 6

(7) Check the room limit concentration.



WARNING

With a multi-type system, the total length of refrigerant tubing is longer, and the amount of additional refrigerant charge is more. For this reason, there is danger that refrigerant leaking into a small room may cause persons in the room to be asphyxiated. The room limit concentration is determined as follows according to the "Installation Standards for Refrigeration and Air Conditioning Equipment (KHK-S0010)" - voluntary standards created by the High Pressure Gas Safety Institute of Japan.

$$\frac{\text{Total amount of refrigerant charge (kg) for the system}}{\text{Smallest room volume (m}^3\text{) where an indoor unit is installed}} \leq \text{Limit concentration } 0.3 \text{ kg/m}^3$$

No special measures are required if the concentration is at or below the limit concentration of 0.3 kg/m³. However, special measures are required if the concentration is above 0.3 kg/m³.

Installation guidelines to ensure safety in the event of refrigerant leakage with a multi-type package A/C (JRA-GL13-1998)

If the above relationship is not satisfied, use the following guidelines to select and install the system, and to prepare adequate mechanical ventilation devices.

1. Selecting the A/C system

The maximum values for the refrigerant charge that can be selected for each room volume are indicated by the area outside the range of diagonal lines in Fig. 7. If the value is within the range of the diagonal lines, then either effective openings for ventilation must be created to increase the room volume, or the outdoor unit capacity and/or tubing length must be changed to reduce the amount of total refrigerant charge. However, this is not necessarily the case when 2 or more independent measures are taken to ensure the safety of persons inside the room in the event of refrigerant leakage.

2. Selecting an indoor unit type

An indoor unit with an installation position 2 m or higher above the floor is recommended.

3. Restrictions on the tubing connections between living spaces

Tubing connections must be subjected to a reliable airtightness test after the completion of work. The test must conform to JIS-B-8607 (refrigerant flared and brazed joints).

4. Combined use of a ventilation system

- (a) Mechanical ventilation devices must be used in order to reduce the concentration of leaked refrigerant.
- (b) Mechanical ventilation devices which introduce outside air at a location 2 m or higher above the room floor are recommended.
- (c) The ventilation volume of the mechanical ventilation devices must be at or above the volume shown in Fig. 7, according to the amount of refrigerant gas and room volume.
- (d) Be sure to create openings that improve ventilation (such as the bottom gap of room doors).
- (e) The ventilation system must operate at all times, regardless of whether the A/C device is in use or not, and regardless of whether there are persons in the room or not. If this is not possible, a sensor system must be used to automatically operate the ventilation system when refrigerant leakage is detected.

5. Restrictions and precautions for tubing installation

- (a) Tubing must include earthquake-resistant support to prevent damage resulting from earthquakes or other external forces.
- (b) When adding support to the tubing, create relief in the axial direction to prevent the occurrence of thermal stress.

6. Flowchart showing refrigerant leakage measures: Omitted

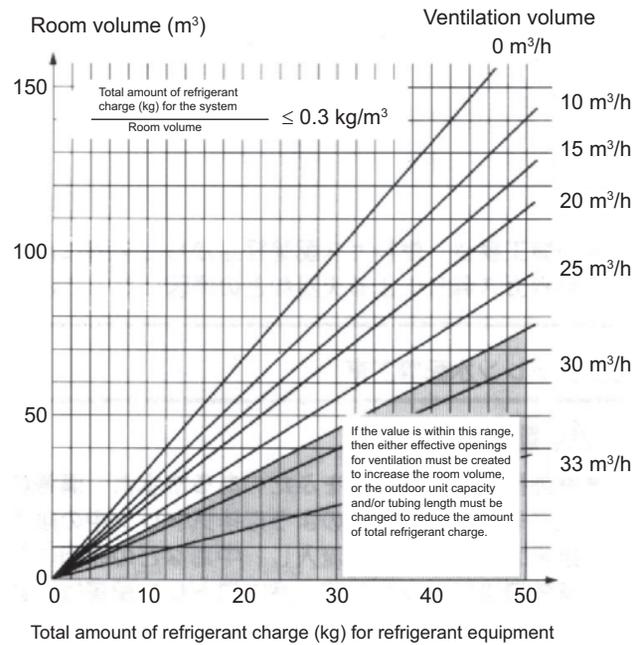


Fig. 7 Selecting a System According to Ventilation Volume

- If the following is true in Fig. 7, then ventilation devices with the indicated ventilation volume are required: $2/3 > \text{Total amount of refrigerant charge for the system} / \text{Room volume} > 0.3$
- The range indicated by in Fig. 7 is the range in which: $\text{Total amount of refrigerant charge for the system} / \text{Room volume} \geq 2/3$. If the value is within the range indicated by , either the room must be enlarged (for example, by removing a door connecting to the next room), or the outdoor unit must be reduced in size.
- For example, consider the case where a 2.8 kW indoor unit is installed in a 16.5 m², 2.7 mH room, and is connected to a single 56.0 kW outdoor unit. If 18 kg of refrigerant is added to the charge, the total charge is 17 + 18 = 35 kg.
 $35 \div (16.5 \times 2.7) = 0.79 > 2/3 (= 0.67)$
 Because this is within the range on the graph indicated by , either the room must be made larger or the outdoor unit must be reduced in size.

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2. PRECAUTIONS FOR INSTALLATION WORK

(1) Foundation construction



WARNING

- The foundation for the outdoor A/C unit must be made of concrete or similar material, and must be sturdy and level, with good drainage. Failure to create a suitable foundation may result in the outdoor unit tipping over, causing gas leakage or personal injury.
- When installing the outdoor unit, be sure to use the specified size of anchor bolts (shown in Fig. 8) and anchor the unit security. Failure to do so may result in the outdoor unit tipping over, causing gas leakage and personal injury.
- Spread a vibration-resistant mat over the surface where the bottom of the outdoor unit contacts the ground, so that the load is applied evenly. Use rubber bushings and anchors in such a way does not diminish the vibration-resistant effects.

Foundation diagram (mat foundation)

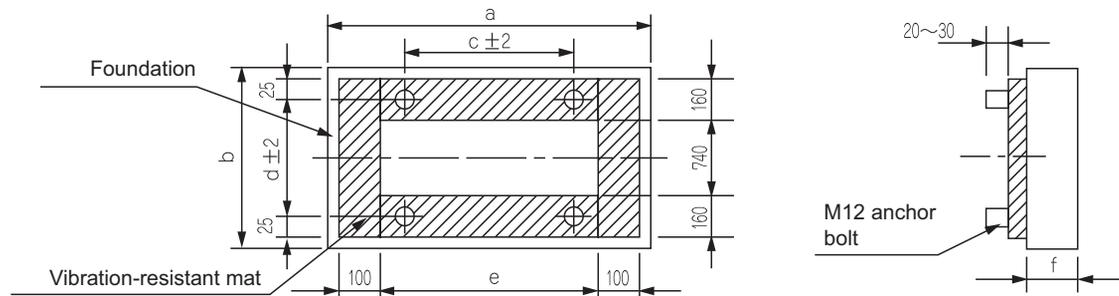


Fig. 8

Unit: mm

Table 6

			a	b	c	d	e	f
35.5/45.0/ 56.0/71.0 kW	Installation on ground		1,850 or more	1,150 or more	1,000	1,014	1,600	120 or more
	Installation on roof	Without vibration-resistant frame		1,450 or more				140 or more
		With vibration-resistant frame (single type)	2,000 or more	1,600 or more				
		With vibration-resistant frame (interlocking type)	1,850	1,600				

Unit: mm

- Be sure to take the following steps to prevent shifting of the foundation.
 - A mat foundation that is simply placed on a floor slab (A-a type) must be of the dimensions shown in the table above or larger in order to prevent shifting of the foundation in case of earthquake. If the mat foundation is smaller than these dimensions, take steps such as connecting the foundation and the building structure with reinforcing bars, in accordance with building utilities earthquake-resistant design and construction guidelines.
 - Foundation types A-b, A-c, A-d, and A-e are provided as examples.
- Use one of the following types of anchors. Use bolts of size M12 or larger for all bolts.
 1. Embedded-type: L-type, LA-type, headed bolts, J-type, JA-type
 2. Blockout-type: L-type, LA-type, headed bolts, J-type, JA-type (Make dimension "f" of the foundation 180 mm or more.)
 3. Plastic anchor
 4. External-thread type mechanical anchor
(Note) Do not use an internal-thread type mechanical anchor.

- If you wish to reduce the foundation weight when installing on a roof, use a light-weight foundation that utilizes a suitable steel frame (for more information, please contact sales office)
The light-weight foundation is in accordance with building utilities earthquake-resistant design and construction guidelines. For construction, follow the installation instructions from the manufacturer supplying the steel frame.

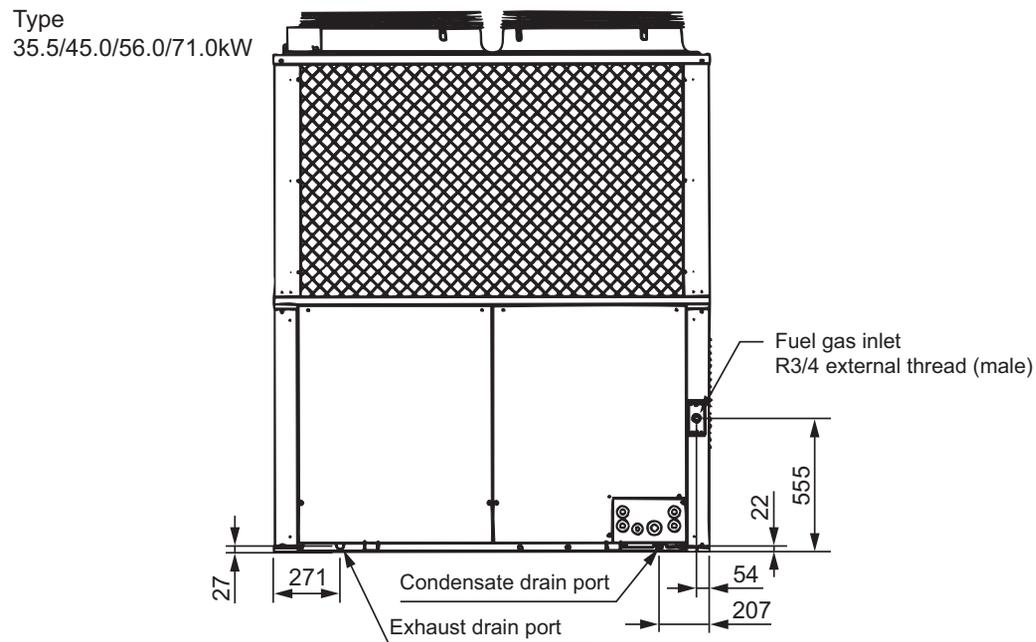


Fig. 9

(2) Fuel piping work

As needed, attach devices 1 to 5 to the outdoor unit external fuel gas pipe. (Fig. 10)

1. Flexible gas hose 2. Pressure release tap 3. Strainer 4. Master valve 5. Pipe bracket



- Use a reinforced gas hose or a low-pressure gas hose with fuel gas joint bracket between the fuel gas pipe master valve and the outdoor unit. In addition, avoid excess pressure or shock to the outdoor unit's fuel gas inlet by taking measures such as making the pipe path leading up to the gas hose as short as possible. Otherwise, there is danger of fire resulting from fuel gas leakage.
- If necessary, install pipe brackets in the fuel gas pipe path to reduce the risk of pressure or shock to the pipe path. In particular, take sufficient precautions when installing near roads. There is a danger of fire or explosion resulting from fuel gas leakage.
* In regions with heavy snowfall, take precautions to protect the fuel gas pipe path from snow damage (Fig. 11).
- After installation work is completed, check that there is no gas leakage from the fuel gas pipe/hose path. There is danger of fire resulting from fuel gas leakage.
- To ensure safety in case of a gas leak, make sure that airflow surrounding the outdoor unit is sufficient and gas will not accumulate. Accumulation of gas may result in fire or explosion.

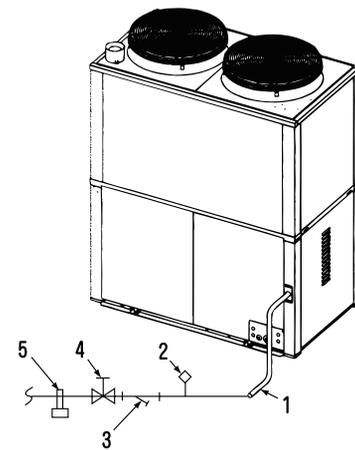


Fig. 10 Fuel Pipe Structure Diagram

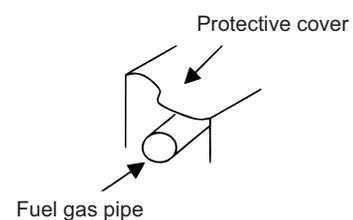


Fig. 11 Fuel pipe protection example

(3) Exhaust drain pipe work



- If connecting the outdoor unit's exhaust drain to a covered drainage basin or gutter, or draining multiple outdoor units to the same location, be sure to configure the pipes (as shown in Fig. 12) so that exhaust gases are discharged into open air. (Make sure that the opening in the receiving drain pipe is at least 50A in nominal diameter.) Exhaust gases flowing into the building or indoor/outdoor units may result in poisoning or corrosion of the unit.
- If a pipe is used for outdoor unit exhaust draining, do not use the same pipe for other purposes (condensate draining for outdoor units, indoor unit draining, etc.). Exhaust gases flowing into the building or indoor/outdoor units may result in poisoning or corrosion of the unit.



- If installing the outdoor unit on a roof, extend the exhaust drain pipe to the water drain (as shown in Fig. 13).
PROHIBITED: Do not install the drain pipes so they drain directly onto concrete surfaces, waterproof sheets, or metal roofing.
Doing so may result in discoloring of concrete and metal surfaces, damage to waterproof sheets, holes, and other damage.
- Slope the drain pipe at a gradient of 1/50 or more, and do not taper the pipe diameter (Fig. 12, 13). In addition, do not create any traps or peaks in the pipe.
- If connecting multiple outdoor units to a single exhaust drain pipe, be sure to prevent exhaust gases from flowing backward by allowing the gases to discharge into open air where the drain hose enters the drain pipe (with the drain pipe opening at least 50A in nominal diameter). Exhaust gases flowing back into the outdoor units while they are stopped may result in starting failures, engine stalls, corrosion of the unit, and other problems. In addition, take measures to prevent drain water from splattering in locations where wind is strong.
- In cold regions where the exhaust drain pipe is likely to freeze, wrap heat tape or take other measures to prevent freezing.
- Use PVC or stainless steel tubing for the exhaust drain pipe.
- As condensed water drips from the unit, be sure to install it in a location with good drainage. (Tubing for the condensate drain port (Fig. 9) is not necessary, but follow the above precautions if tubing is installed.)
* Condensed water from the refrigerant tubing inside the unit is released through the condensate drain port. Condensed water from the heat exchanger and water that gets inside the unit is released through the drainage ports located at the center of either side panel.

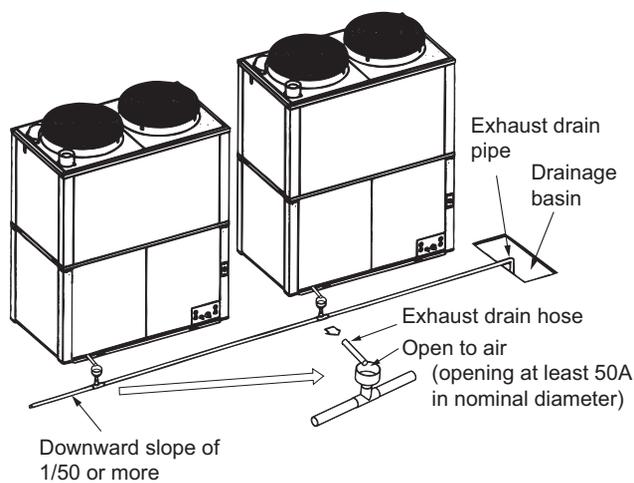


Fig. 12 Draining the exhaust into a drainage basin

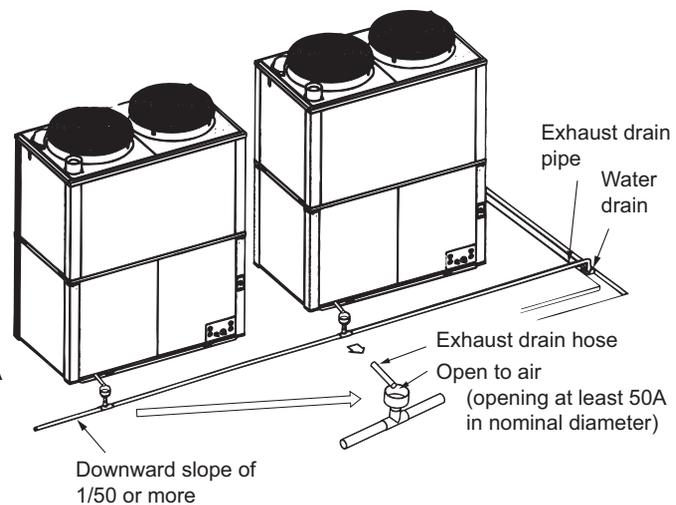


Fig. 13 Draining the exhaust into a water drain (roof)

3. INSTALLATION PROCEDURE

3-1. Anchoring the outdoor unit

Transporting the outdoor unit by hoist:

- For hoisting, pass the rope over the hoisting brackets on the unit vase at 4 locations. (Fig. 14)
- Insert wood separators as protective shielding when using the hoist to prevent the outer casing from being scratched or deformed by the rope. Be sure not to touch or apply pressure on tube connectors. (Fig. 14)
- When hoisting with a crane, the crane hook position must be 1 m or more above the unit.

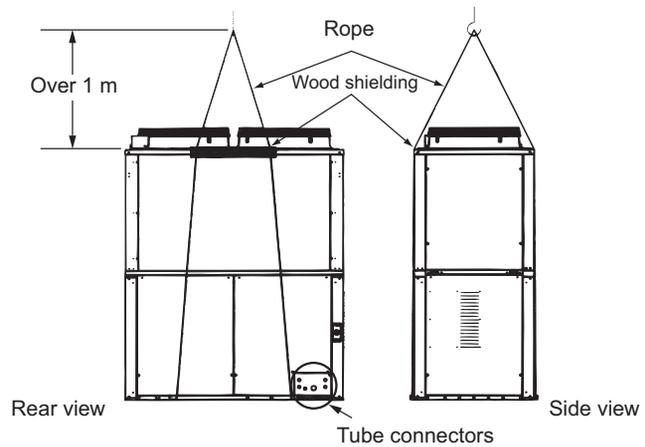


Fig. 14



CAUTION

- Do not lay the outdoor unit on its side during transportation. This can damage the devices and result in malfunction.

3-2. Preparing and installing the tubing

- Material: Phosphorous deoxidized copper seamless tubing (C1220T)
- Tube size: Use the correct size according to Table 7.

Table 7

Tube size (mm)		
Outer dia.		Thickness
φ9.52	(C1220 O)	T0.8
φ12.7	(C1220 O)	T0.8
φ15.88	(C1220 O)	T1.0
φ19.05	(C1220 O)	T1.2
	(C1220 1/2,H)	T1.0
φ22.22	(C1220 1/2,H)	T1.0
φ25.4	(C1220 1/2,H)	T1.0
φ28.58	(C1220 1/2,H)	T1.0
φ31.75	(C1220 1/2,H)	T1.1
φ38.1	(C1220 1/2,H)	T1.35

Gas tube (wide)



Select tube sizes from Table 2, 3, 5, and prepare the tubing.

Liquid tube (narrow)

Branch tube: Purchase separately.

- After cutting the tube, be sure to remove all burrs and finish tubing ends to the correct surface. (The same must be done for branch tubes (purchased separately).)
- When bending tubes, be sure the bend radius is at least 4 times the outer diameter of the tube.
- When cutting or bending tubes, be careful not to cause any pinching or blockage of the tube.

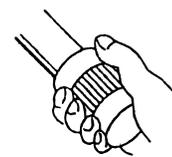


Fig. 15



CAUTION

- Prevent foreign substances such as dirt or water from entering the tube by sealing the end of the tubes with either a cap or with tape. Otherwise, this can damage the devices and result in malfunction.

3-3. Connecting the refrigerant tubing

1. Remove the fastening rubber.
2. Connect the tubes and perform brazing.
3. Reattach the gas tube, liquid tube fastening panel, and fastening rubber as they were originally.

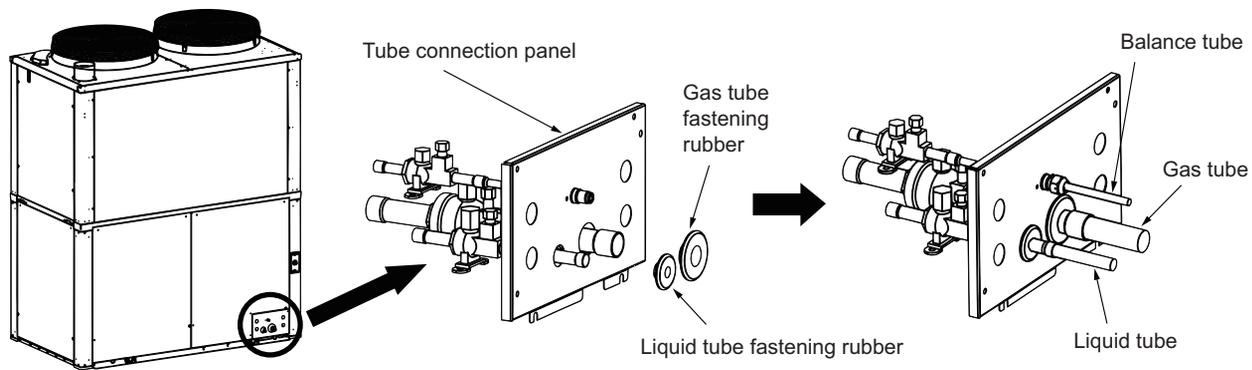


Fig. 16

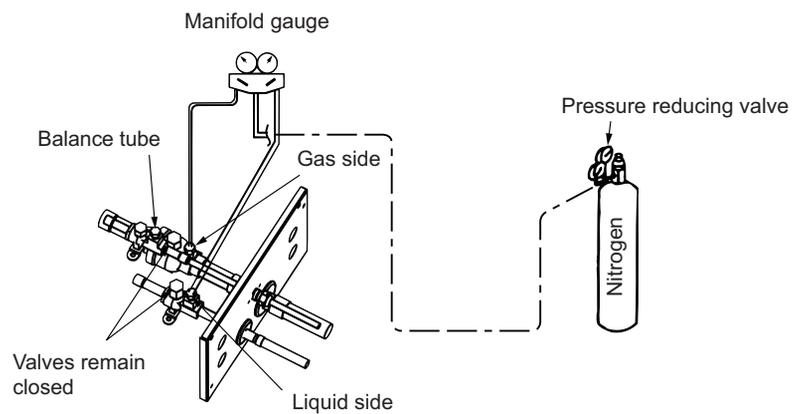


Fig. 17



Be sure to perform the following before brazing.

- The rubber that fastens the tubes is damaged easily by heat. Be sure to remove it before brazing.
- Cool the tubes with wet cloths or other materials to prevent the valve inside the machine from being damaged by the brazing heat.
- Be sure to replace the contents of the tube with nitrogen to prevent the formation of an oxide film.
- Do not use commercially available oxide film agents (antioxidants). They can adversely affect the refrigerant and the refrigeration oil, and can cause malfunctions.

If using flare connections (for the indoor connectors or other part), apply refrigeration oil to the flared part.

3-4. Tubing airtightness test and vacuum application

An airtightness test is required for gas heat pump A/C as part of industry installation guidelines. Follow the procedure below to perform the test and confirm there is no leakage from any connections.

- Connect the manifold gauge to both service ports - on the wide tube side and narrow tube size. Then connect the nitrogen tank, vacuum pump, and other items as shown in Fig. 18.
- When performing airtightness tests or creating vacuums, perform them for all service ports simultaneously. (All outdoor unit valves should remain closed.)
Always use nitrogen for the airtightness test. (Do not use oxygen, carbon dioxide, other refrigerants, etc.)
When performing the airtightness test for newly installed indoor/outdoor unit tubing, we recommend testing the tubes separately before connecting them to outdoor units.

CAUTION

The service ports are check valves.



CAUTION

Use nitrogen to raise the pressure to the airtightness test pressure (4.15 MPaG) and confirm that there is no leakage. Refrigerant leakage can cause suffocation and injury to nearby persons.

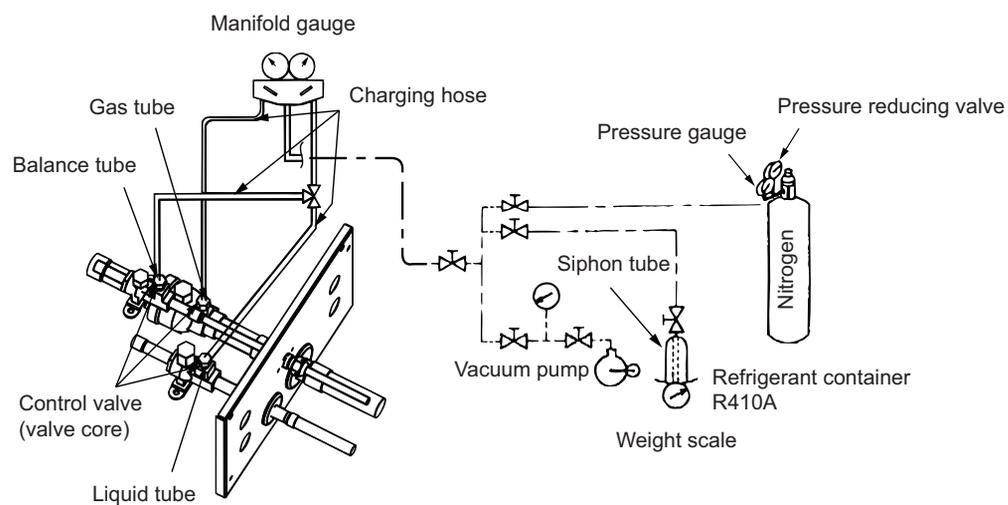


Fig. 18

- After the airtightness test is completed, apply vacuum of 667 Pa (-755 mmHg, 5 Torr) or below to the indoor unit and tubing.
- Do not leave for a long period of time after the vacuum state has been reached.

3-5. Refrigerant charge

Calculation of amount of additional refrigerant charge

(1) Table 9 shows the refrigerant charge at factory shipping time. Additional refrigerant must be added according to the size and length of the tubing (calculated from the size and diameter of the liquid tubing using the values in Table 8).

Table 8 Quantity of additional refrigerant charge

Liquid tube size (mm)	Additional charge quantity per meter (g/m)
φ 9.52	56
φ12.7	128
φ15.88	185
φ19.05	259
φ22.22	366

Table 9

Model No.	Quantity of refrigerant charge when shipped (kg)
Type 120	11.5
Type 150	
Type 190	
Type 240	

$$\text{Required additional refrigerant charge (g)} = 366 \times (A) + 259 \times (B) + 185 \times (C) + 128 \times (D) + 56 \times (E) + \text{Unit additional charge amount (F)}$$

- (A) = total length in meters of 22.22 mm diameter liquid tubing
- (B) = total length in meters of 19.05 mm diameter liquid tubing
- (C) = total length in meters of 15.88 mm diameter liquid tubing
- (D) = total length in meters of 12.7 mm diameter liquid tubing
- (E) = total length in meters of 9.52 mm diameter liquid tubing
- (F) = Unit additional charge amount (Table 10)

Table 10

Model No.	Unit additional charge amount (kg)
Type 120	1.5
Type 150	
Type 190	4.5
Type 240	8.5

(2) Be careful to charge accurately according to refrigerant weight.

(3) Charging procedure

Evacuate the system, close the gauge manifold at the gas tube side to ensure that no refrigerant enters the gas tube side, then charge the system with liquid refrigerant at the liquid tube side. While charging, keep all valves fully closed.

The compressor can be damaged if liquid refrigerant is added at the gas tube side.

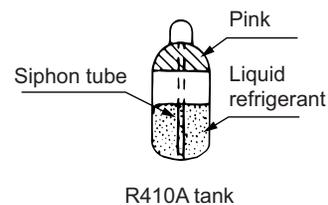
(4) If the system does not accept the predetermined quantity of refrigerant, fully open all valves and run the system (either heating or cooling). While the system is running, gradually add refrigerant at the low pressure side by slightly opening the valve on the cylinder just enough so that the liquid refrigerant is gasified as it is sucked into the system. (This step is normally only needed when commissioning the system.) All outdoor unit valves should be fully open.

(5) When charging is completed, fully open all valves.

(6) Avoid liquid back-flow when charging with R410A refrigerant by adding small amounts at a time.

Notes

- When charging with additional refrigerant, use liquid only.
- R410A cylinders are colored gray with a pink top.
- Check whether a siphon tube is present (indicated on the label at the top of the cylinder).
- Depending on refrigerant and system pressure, conventional refrigerant (R22, R407A) equipment may or may not be compatible with R410A equipment, so care is needed. In particular, the gauge manifold used must be specifically designed for R410A.
- Be sure to check the limiting density.
- Refer to the section “4. OPENING THE CLOSED VALVES” when the instructions call for fully opening all valves.



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3-6. Finishing the outer tubing covering



- Apply thermal insulation to all tubing, including branch tubes. Make sure that there are no gaps or openings in the thermal insulation that may allow moisture to enter. Use thermal insulation that can withstand a minimum of 120°C for the gas side (wide tube system), and a minimum of 80°C for the liquid side (narrow tube system). Failure to do so can result in water leakage and dripping condensation, leading to wall discoloration, puddling, etc.
- Use separate piping for the power cables and the control cables. If the cables are passed through the same pipes, the effects of electrical noise and induction can cause malfunctions.

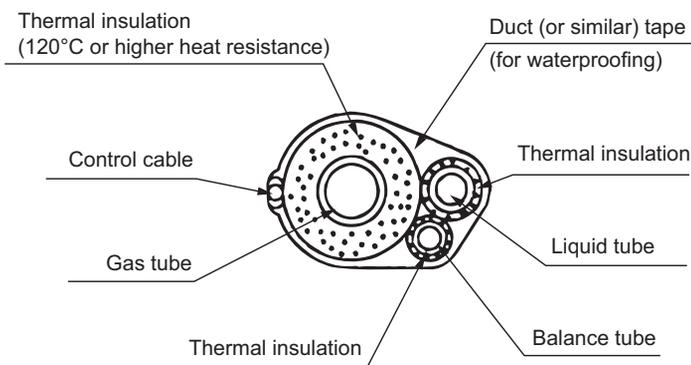


Fig. 19

4. OPENING THE CLOSED VALVES

Ball valves are used for the closed valves on the outdoor unit. Each can be opened and closed by rotating the tab 90 degrees.

Follow the procedure below to securely open the valves.

1. Remove the cap.
2. Slowly and securely turn the tab to the left (counterclockwise) 90 degrees. (Do the same for the gas, liquid, and balance tubes.)
The valve is fully open when the tab has been rotated 90 degrees (when it contacts the stopper). Do not forcefully attempt to turn the tab past this point.

CAUTION

Be sure to open the closed valve all the way.

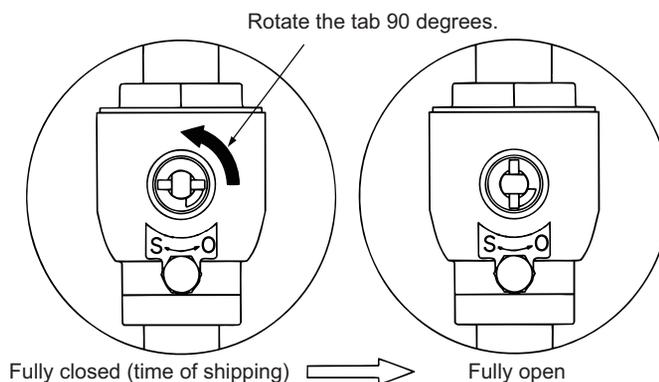


Fig. 20 Rotating the Tab

3. Attach the stopper ring securely to the liquid side (narrow tube) and gas side (wide tube). Then reattach and tighten the cap.

- Cap tightening torque

Liquid side	13 N·m (355/450)
Liquid side	30 N·m (560/710)
Gas side	30 N·m
Balance tube	13 N·m

5. AFTER INSTALLATION IS COMPLETED

- Record the actual length of refrigerant tubing and the amount of refrigerant charge. With the outdoor unit, the “label for showing the actual length of refrigerant tubing and the amount of refrigerant charged” is provided. Enter the details in the designated spaces, and apply the label to the inside of the electrical box panel, at the top.

**This will be needed for subsequent maintenance.
Be sure to enter this information and apply the label.**

6. ENGINE REPLACEMENT PATHWAY

- During installation, consider the engine external dimensions listed at right and ensure that there is a sufficient pathway for moving the engine. This pathway will be required should the engine need to be replaced.

Table 11

Engine external dimensions (mm)			Package weight (kg)
Width	Depth	Height	
670 (1000)	640 (900)	650 (720)	170

* Figures in parentheses are the external dimensions of the wood shipping crate.

7. USING A VIBRATION-RESISTANT FRAME

- A vibration-reduction frame must be used if the unit is installed in locations where noise and vibration can be a problem, such as on rooftops above living spaces or conference rooms. If a vibration-resistant frame is used, be sure to install steady braces or other support, and take measures to prevent applying excessive force to the refrigerant tubing.
- Refer to the instruction manual supplied with the vibration-resistant frame when installing the frame.

(1) When Using Singular Frames

- Run the balance tube along the path of the gas and liquid tubes to connect outdoor units.
- When anchoring the refrigerant tubing, be sure to set the tubing anchor for each outdoor unit at least 1.5 m away from the respective unit (as shown in Fig. 21).
- When installing a ball valve, be sure to install them within area B. (Installation in area A is prohibited.)

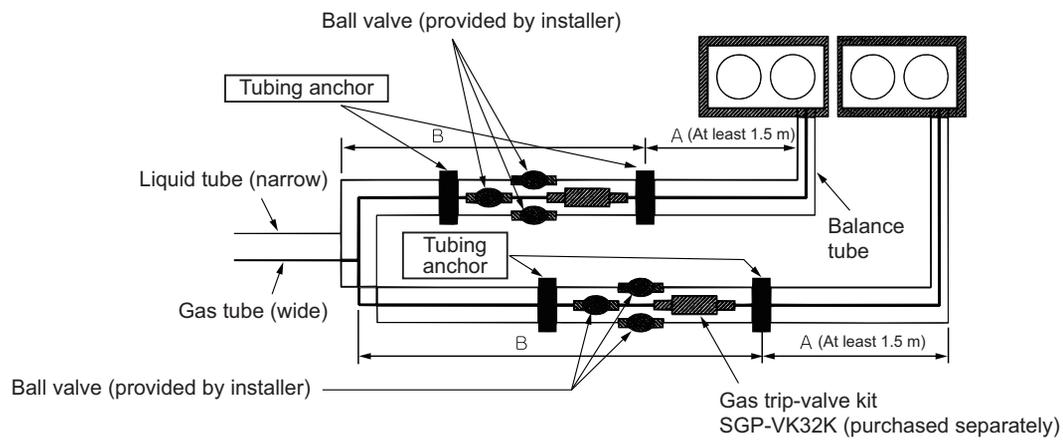


Fig. 21



CAUTION

When using single-type vibration-resistant frames, never install tubing in the manner shown at the right. Doing so puts excessive weight on the entire tubing installation and may result tube damage.

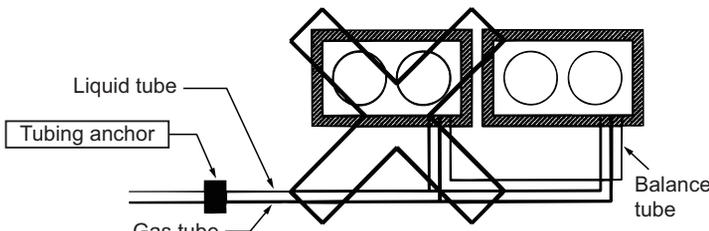


Fig. 22

(2) When Using Interlocking Frames

- When using interlocking vibration-resistant frames, always use frames designed for use with the GHP-W Multi series.
- After installing the frame, be sure to install steady braces or other support, and take measures to prevent applying excessive force to the refrigerant tubing.
- Run the balance tube ($\phi 9.52$) along the path of the gas and liquid tubes (as shown in Fig. 23), and bundle it with the other tubes to prevent vibration.
- If installing gas trip-valve kits or ball valves to each outdoor unit, be sure to install them on the vibration-resistant frame. (Installation on the ground is prohibited.)
- When anchoring the refrigerant tubing, always anchor the tubing at the main tubing to prevent tube damage from excessive weight.
When determining the anchor position, refer to the dimensions for A in Fig. 23.

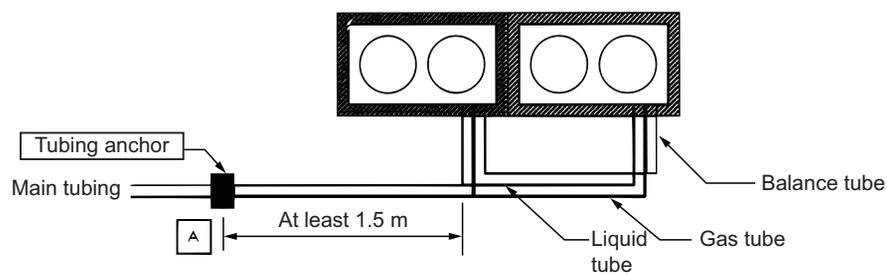


Fig. 23

Procedure and Technical Points for System Installation - Hot Water Circulation

- The following instruction documents are attached for the outdoor unit: "Procedures and Technical Points for Electrical Wiring Work (Outdoors)" and "Procedures and Technical Points for Test Run." Be sure to also refer to these documents.

Precautions on installation for hot water piping



CAUTION

- The permitted pressure in hot water piping in outdoor unit is 0.7 MPa.
- Install suitable water drainage valves and air extraction valves for hot water piping. Air mixing with fluid inside the pipes may result in noise, corrosion and reduced performance.
- Use a hot water circulation volume within the range of 2.1 m³/h to 3.9 m³/h.
- Operation outside this range may result in malfunction due to corrosion in the heat exchanger and freezing in the pipe or in air residue.
- Always provide ample heat insulation work for the hot water pipes.
- Inadequate heat insulation will cause heat loss. There is also a danger of breakage in extremely cold weather.

- Install the hot water circulation pump on the hot water inlet piping side.
- Ensure that the nozzle gauge for the hot water outlet piping is greater than the nozzle gauge of the connecting piping (i.e., 20 A), and that there are as few bending portions and as little flow disturbance in the piping as possible. Also, use union joints near the outdoor unit, and ensure that the unit can be easily separated.
- In the inlet piping of the outdoor unit, install a strainer (80 mesh or greater) to protect the hot water outlet heat exchanger. Also, install valves in the outlet pipes, and before and after the strainer for maintenance and servicing.
- Fit the piping with temperature and pressure gauges. There are necessary for checking and maintenance work.
- Fit the water piping with a water temperature gauge and flow adjustment valve so that it is possible to adjust the rate of hot water flow while reading the water temperature gauge during trial operation. Do not touch the adjustment valve after the adjustment.
- Install support fixtures as appropriate for hot water outlet piping and ensure that the outdoor unit is not subject to excessive loads.

Cleaning of hot water piping and air purging

- Always clean the piping to remove waste and burr and also any remains of flux inside the piping, which may cause deterioration of antifreeze agent and gelling.

Note

Ensure that air is thoroughly discharged. Residual air may prevent water flow and obstruct pipe cleaning.

Antifreeze and antirust



CAUTION

- Failure to use antifreeze may result in damage due to freezing around and resting of the appliance and piping.

- An antifreeze filling method is used to prevent freezing in the water circulation system. For prevention of freezing and rust, always use the recommended antifreeze agent: Sanyo genuine Apollo GHP Coolant S.
- Apply this antifreeze agent at a concentration of 35 to 55% in order to attain the rated performance for rust and freezing prevention. Dilute the antifreeze using tap water.
- Set the level of concentration of the antifreeze referring to a temperature 10°C below the lowest year-round outdoor temperature.

Antifreeze Performance

Concentration (capacity)	35%	40%	45%	50%	55%
Specific gravity (20°C)	1.056	1.063	1.071	1.078	1.085
Freezing point	-20°C	-24°C	-30°C	-35°C	-42°C

Procedures and Technical Points for System Installation (3 WAY-MODEL)



The following is instead for the installer responsible for installation of this air conditioning system, and should be carefully read before beginning.

Applicable models: SGP-M2 model outdoor unit

New Refrigerant R410A

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- In addition, the following instruction documents are attached for the outdoor units : “Procedures and technical Points for Electrical Wiring Work (Outdoors),” and “Procedures and Technical Points for Test Run.” Be sure to refer to these documents.

IMPORTANT!

Please Read Before Starting

This air conditioning system meets strict safety and operating standard. As the installer or service person, it is an important part of your job to install or service the system so it operates safely and efficiently.

For safe installation and trouble-free operation, you must:

- Carefully read this instruction booklet before beginning.
- Follow each installation or repair step exactly as shown.
- Observe all local, state, and national electrical codes.
- Pay close attention to all warning and caution notices given in this manual.



WARNING

This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.



CAUTION

This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.

If Necessary, Get Help

These instructions are all you need for most installation sites and maintenance conditions. If you require help for a special problem, contact our sales/service outlet or your certified dealer for additional instructions.

In Case of Improper Installation

The manufacturer shall in no way be responsible for improper installation or maintenance service, including failure to follow the instructions in this document.

SPECIAL PRECAUTIONS

WARNING When Wiring



ELECTRICAL SHOCK CAN CAUSE SEVERE PERSONAL INJURY OR DEATH. ONLY A QUALIFIED, EXPERIENCED ELECTRICIAN SHOULD ATTEMPT TO WIRE THIS SYSTEM.

- Do not supply power to the unit all wiring and tubing are completed or reconnected and checked.

- Highly dangerous electrical voltage are used in this system. Carefully refer to the wiring diagram and these instructions when wiring. Improper connections and inadequate grounding can cause **accidental injury or death**.
- **Ground the unit** following local electrical codes.
- Connect all wiring tightly. Loose wiring may cause overheating at connection points and a possible fire hazard.

When Transporting

Be careful when picking up and moving the indoor and outdoor units. Get a partner to help, and bend your knees when lifting to reduce strain on your back. Sharp edges or thin aluminum fins on the air conditioner can cut your fingers.

When Installing...

...In a Ceiling or Wall

Make sure the ceiling/wall is strong enough to hold the unit's weight. It may be necessary to construct a strong wood or metal frame to provide added support.

...In a Room

Property insulate any tubing run inside a room to prevent “sweating” that can cause dripping and water damage to walls and floors.

...In Moist or Uneven Locations

Use a raised concrete pad or concrete blocks to provide a solid, level foundation for the outdoor unit. This prevents water damage and abnormal vibration.

...In an Area with High Winds

Securely anchor the outdoor unit down with bolts and a metal frame. Provide a suitable air baffle.

...In a Snowy Area (for Heat Pump-type Systems)

Install the outdoor unit on a raised platform that is higher than drifting snow. Provide snow vents.

When Connecting Refrigerant Tubing

- Use the flare method for connecting tubing.
- Apply refrigerant lubricant to the matching surfaces of the flare and union tubes before connecting them, then tighten the nut with a torque wrench for a leak-free connection.
- Check carefully for leaks before starting the test run.

When Servicing

- Turn the power OFF at the main power box (mains) before opening the unit to check or repair electrical parts and wiring.
- Keep your fingers and clothing away from any moving parts.
- Clean up the site after you finish, remembering to check that no metal scraps or bits of wiring have been left inside the unit being serviced.

Gas Supply Pressure

Gas Supply	Pressure(mbar)		
	Min.	Normal	Max.
G20, G25 (Natural Gas)	17	20	25

Gas Supply	Pressure(mbar)		
	Min.	Normal	Max.
G31 (LPG)	25	37	45

Others



CAUTION

- Ventilate any enclosed areas when installing or testing the refrigeration system. Escaped refrigerant gas, on contact with fire or heat, can produce dangerously toxic gas.
- Confirm upon completing installation that no refrigerant gas is leaking. If escaped gas comes in contact with a stove, gas water heater, electric room heater or other heat source, it can produce dangerously toxic gas.

SAFETY PRECAUTIONS



WARNING

- Be sure to arrange installation from the dealer where the system was purchased or using a professional installer. If you attempt to perform the work yourself, and do so incorrectly, there is danger of poisoning caused by exhaust gases entering the building, as well as danger of water leakage, electric shock and fire.
- Installation work must be performed correctly, in accordance with the instructions listed here. Hazards from incorrect installation include dangerous exhaust gas buildup, water leakage, electric shock and fire.
- Check the type of engine fuel used. If the wrong type of gas is used, the engine can suffer combustion problems, and there is danger of poisoning caused by exhaust gases.
- Ventilate the area in case refrigerant gas leaks during installation work. If refrigerant gas comes into contact with frame during the tube brazing process, toxic gas will be produced.
- When installation work is completed, check that there is no refrigerant gas leakage. If refrigerant gas leaks into the room and contacts the frame of a fan heater, stove, burner, or other device, toxic gases will be produced.
- Never use refrigerants other than the one specified (written on label on the unit).
- When installing or moving the A/C unit, do not allow refrigerants other than the one specified (written on the label on the unit) or air to enter the unit's refrigeration cycle.
- Always use nitrogen for the airtightness test. (Do not use oxygen-based gases.)



CAUTION

- When handling refrigerant gas, do not come in contact with the gas directly. Doing so may result in frostbite.
- Check that all provided parts are present.

Provided documents:

- Remote power switch label
- Label showing the actual length of refrigerant tubing and amount of refrigerant charge
- Seal labels
- This manual ("Procedures and Technical Points for System Installation")
- "Procedures and Technical Points for Test Run"
- "Procedures and Technical Points for Electrical Wiring Work (Outdoors)"

1. SELECTING THE INSTALLATION LOCATION

- (1) Install the gas heat pump A/C so that it satisfies all local regulations and government safety codes, as well as installation standards and service guidelines for industrial gas devices.
- (2) Choose a suitable installation location (with adequate space for servicing), as below.



WARNING

- Install the outdoor unit in a location where exhaust gases will not enter the building's air intake or exhaust vents or windows, and will not enter the building through tubes or vents that lead inside the building. There is danger of poisoning if exhaust gases enter the building.
- Install the outdoor unit outdoors, in a location open to the air, so that there is no accumulation of exhaust gases.
There is danger of the gases entering the building and causing poisoning.
- The exhaust gases must be open to the air in a location where they will not adversely affect the surroundings.
There is danger of exhaust gases entering the building and causing poisoning. (Be certain not to allow exhaust gases to be discharged into a drainage basin, gutter, or similar location.)
- Install the outdoor unit securely in a location that can fully bear the weight of the unit.
There is danger of gas leakage or injury if the outdoor unit tips over or falls.



CAUTION

- The allowances shown in Fig. 1 are for the space required for maintenance work. Be sure to provide this minimum space when selecting the location of the unit.
Failure to do so may result in injury caused by the outdoor unit tipping over during maintenance, or in difficulty in servicing the unit.
- If the outdoor unit is installed on a roof or other elevated location, install a permanent ladder, handrails, and other necessary items in the passageway leading up to the unit, and install a fence, handrails, or similar structure around the outdoor unit. Failure to do so may result in injury caused by the unit tipping over during maintenance.
- Be sure to stand on a stable surface when installing the outdoor unit on an elevated base or location, and avoid using stepladders.
- Leave the distances shown in Fig. 2 between the outdoor unit and any flammable materials.
There is danger of fire if these distances are insufficient.
- Do not install the outdoor unit in a location where flammable gases may be generated, flow, accumulate or leak, or in a location where volatile substances are handled or stored. There may be danger of fire or explosion if the unit is installed in such a location.
- Install the outdoor unit in a location where exhaust gases and fan air will not harm plants or animals.
The exhaust gases and fan air may adversely affect plants and animals.
- Avoid installation near locations such as parking lots and flowerbeds where damage from clinging dust and particles may occur. If installation in such locations is unavoidable, be sure to put a covering on the outdoor unit or take other measures to protect it.
- In addition to heeding the WARNING and CAUTION notes, avoid installation in locations where the unit will be exposed to the following:
 - excessive dust
 - excessively salty air, such as near the sea
 - sulfuric gases, such as near hot springs
 - excessive water, vapors, or oil fumes (ex: from machines)
 - fumes from organic solvents
 - high fluctuations in power voltage
 - electromagnetic interference from other devices
- In order to improve heat exchange, install the outdoor unit in a location that is well ventilated. The spaces for each part must be as shown in Figs. 1 and 2.
If installing in a poorly ventilated location, or if installing multiple outdoor units, ensure sufficient space to prevent short circuits.

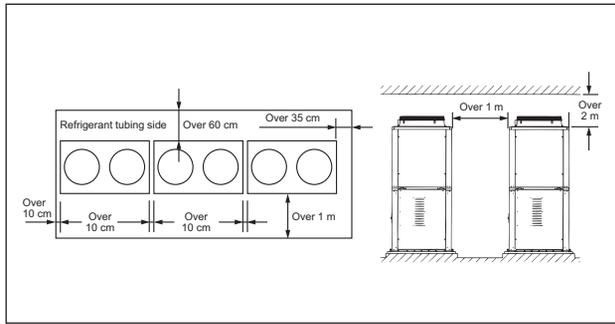


Fig. 1

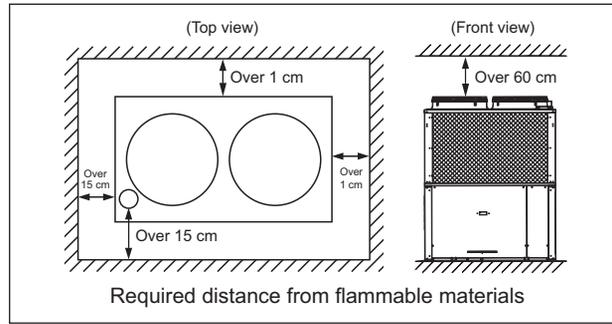


Fig. 2

- (3) In snowy regions, be sure to install a snow-protection hood and enclosure.
Even in regions that do not have heavy snowfall, install a snow-protection roof (such as a snow hood) if the unit is installed in a location where snow may build up and fall from the building's roof or other surface onto the unit. (Install the hood so that the coolant supply opening at the top of the unit can be used.)
- (4) Take care that operating noise and exhaust do not disturb neighboring buildings or homes.
In particular, install so that noise-related local environmental standards, if any, are satisfied at the border with a neighboring dwelling.
- (5) Electrical noise resulting from this gas heat pump A/C may affect other electrical devices. When installing and wiring, take care to leave sufficient space (3 m or more) between the A/C units (indoor and outdoor units) - or the power cables - and any other units, antennas, signal cables, or power cords of televisions, radios, stereos, intercoms, computers, word processors, telephones, and similar devices.
- (6) Select an installation location so that the length of refrigerant tubing is within the ranges shown in the table below.

Table 1

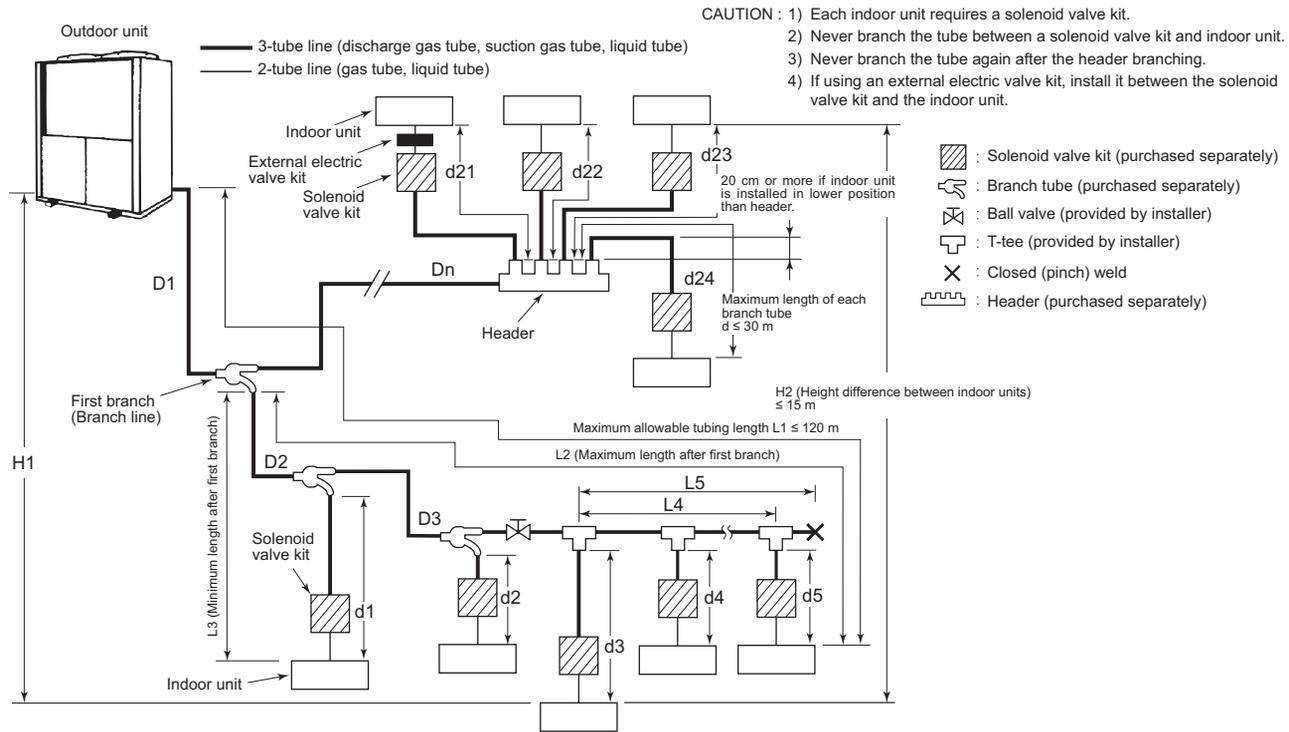
Indoor unit		45.0kW	56.0kW	71.0kW
Capacity proportion of the indoor units to the outdoor unit		50 - 200%		
Minimum capacity of indoor units that can be connected		≤ 22 type (equivalent to 0.8 horsepower)		
Maximum number of indoor units (systems) that can be connected		24		
Maximum allowable tubing length (L)	L1	≤ 120 m (equivalent length + 145 m) ^{(*)1}		
Difference between longest and shortest tubing lengths after the No. 1 branch (first branching point)	L2 - L4	≤ 30 m		
Maximum length of each tube branch	ℓ1, ℓ2...ℓ8	≤ 30 m		
Maximum allowable height difference between indoor and outdoor units	If outdoor unit is above	H1	≤ 50 m	
	If outdoor unit is below	H2	≤ 35 m ^{(*)2}	
Maximum allowable height difference between indoor units	H3	≤ 15 m ^{(*)3}		
Maximum length from the first T-tee to the last T-tee	L3	≤ 2 m		

- (*1) The minimum length of tubes between outdoor units and indoor units is 7 m.
(*2) If cooling mode is expected to be used when the external temperature is 10°C or below, install so the maximum length is 30 m.
(*3) Install so that the height difference between indoor units after the final branch is within the limits shown in the figure on the next page.

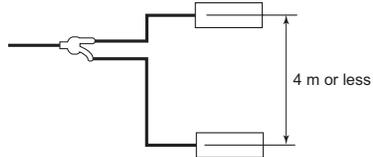
- The grouping of tubes that connect the outdoor units to the indoor units is referred to as the "main tubing."

When the maximum tubing length is more than 90 m (equivalent length), upgrade the tube size 1 rank for both the liquid and gas tubes of the main tubing.
The prescribed performance cannot be guaranteed if the wrong size is selected.

- The maximum number of indoor units that can be connected is 24. The capacities that can be connected to the indoor units are 50 - 200%.



Height difference between indoor units after the final branch must be less than 4 m.



If height difference between indoor units after the final branch cannot be less than 4 m, divide the height difference between upper and lower units (2 to 1).

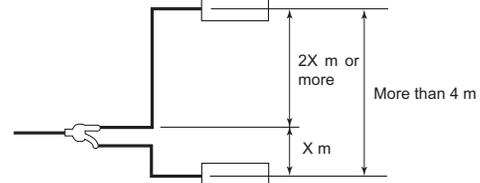


Fig. 3 Length of Refrigerant Tubing

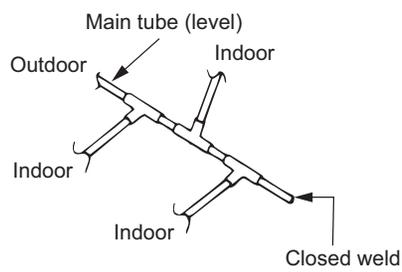


Fig. 4 Level Use

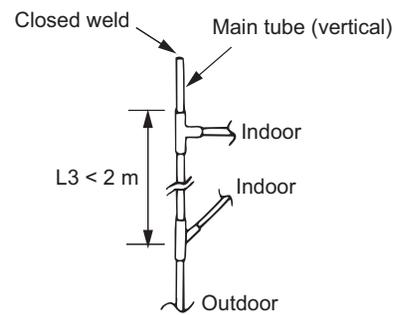
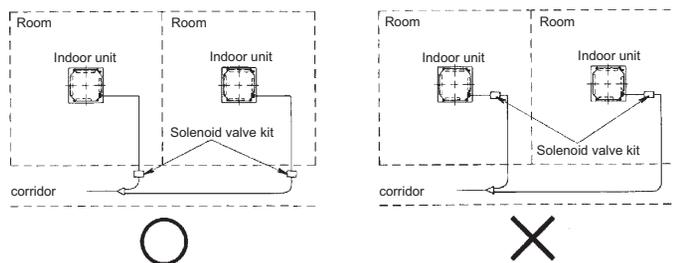


Fig. 5 Vertical Use

- Arrangement of Solenoid valve Kit.
 - Please attach Solenoid valve kit to a less than 30 m place from an indoor unit.
 - For conference rooms and other locations where low noise is required, pay attention to the installation location and install on a corridor etc.
 - Please prepare the check place for service near a kit.

Solenoid Valve Kit

- ATK-RZP56BGB
(For 74 to 184 indoor unit)
- ATK-RZP160BGB
(For 254 to 604 indoor unit)



CAUTION

1. The precautions for use of the separately purchased branch tube () are included in the package with the part. Be sure to refer to them.
2. When using a T-tee branch tube (provided by installer) (only with L3 at 2 m or less), the main tubing must be either level or vertical. The openings of each branch tube must be at a raised angle from the ground when the main tubing is level. The openings can be set at any angle when the main tubing is vertical, but be sure to curve a portion of the connected tubing upward. Always close weld the end point of the T-tee tubing. In addition, pay special attention to the insertion dimensions for each connected tube so that refrigerant flow is not blocked at the T-tee branches. Be sure to use only standard T-tees.
3. Do not use commercially available Y-shape joints () for liquid tubing (for the branch tubing that is provided by the installer).

Table 2-1 Main tubing size after distribution (D2, D3, Dn)

Outdoor unit	Outdoor tubing		Post-branch main tubing				
			Total capacity for connected indoor units (kW)				
			35.6 to 142.0	28.1 to 35.5	16.1 to 28.0	9.0 to 16.0	Under 9.0
45.0 kW	Suction tube	φ28.58 (φ31.75)	φ28.58 (φ31.75)	φ28.58	φ25.4	φ19.05	φ15.88
	Discharge tube	φ22.22	φ22.22	φ22.22	φ19.05	φ15.88	φ12.7
	Liquid tube	φ19.05	φ19.05	φ15.88	φ12.7	φ9.52	φ9.52
56.0 kW	Suction tube	φ28.58 (φ31.75)	φ28.58 (φ31.75)	φ28.58	φ25.4	φ19.05	φ15.88
	Discharge tube	φ25.4	φ25.4	φ22.22	φ19.05	φ15.88	φ12.7
	Liquid tube	φ19.05	φ19.05	φ15.88	φ12.7	φ9.52	φ9.52
71.0 kW	Suction tube	φ28.58 (φ31.75)	φ28.58 (φ31.75)	φ28.58	φ25.4	φ19.05	φ15.88
	Discharge tube	φ25.4	φ25.4	φ22.22	φ19.05	φ15.88	φ12.7
	Liquid tube	φ19.05	φ19.05	φ15.88	φ12.7	φ9.52	φ9.52

If the equivalent length of tubing is 90 m or more or if the total capacity for connected indoor units exceeds 130%, use the suction tube size in ().

Table 2-2 Distribution ⇔ Solenoid valve kit connection tubing (3-tube line)

Indoor unit	Type	22	28	36	45	56	71	80	90	112	140	160
		Equivalent HP	0.8	1	1.3	1.6	2	2.5	3	3.2	4	5
Tubing size	Suction tube	φ15.88										
	Discharge tube	φ12.7										
	Liquid tube	φ9.52										

Table 2-3 Solenoid valve kit ⇔ Indoor unit connection tubing (2-tube line)

Indoor unit	Type	22	28	36	45	56	71	80	90	112	140	160
		Equivalent HP	0.8	1	1.3	1.6	2	2.5	3	3.2	4	5
Tubing size	Gas tube	φ12.7 ^(*1)			φ12.7			φ15.88				
	Liquid tube	φ9.52										

(*1) Solenoid valve kits (option) and indoor units should be joined by flare connection. Please refer to the operation manuals.

(7) Check the room limit concentration.



WARNING

With a multi-type system, the total length of refrigerant tubing is longer, and the amount of additional refrigerant charge is more. For this reason, there is danger that refrigerant leaking into a small room may cause persons in the room to be asphyxiated. The room limit concentration is determined as follows according to the “Installation Standards for Refrigeration and Air Conditioning Equipment (KHK-S0010)” - voluntary standards created by the High Pressure Gas Safety Institute of Japan.

$$\frac{\text{Total amount of refrigerant charge (kg) for the system}}{\text{Smallest room volume (m}^3\text{) where an indoor unit is installed}} \leq \text{Limit concentration 0.3 kg/m}^3$$

No special measures are required if the concentration is at or below the limit concentration of 0.3 kg/m³. However, special measures are required if the concentration is above 0.3 kg/m³.

Installation guidelines to ensure safety in the event of refrigerant leakage with a multi-type package A/C (JRA-GL13-1998)

If the above relationship is not satisfied, use the following guidelines to select and install the system, and to prepare adequate mechanical ventilation devices.

1. Selecting the A/C system

The maximum values for the refrigerant charge that can be selected for each room volume are indicated by the area outside the range of diagonal lines in Fig. 6. If the value is within the range of the diagonal lines, then either effective openings for ventilation must be created to increase the room volume, or the outdoor unit capacity and/or tubing length must be changed to reduce the amount of total refrigerant charge. However, this is not necessarily the case when 2 or more independent measures are taken to ensure the safety of persons inside the room in the event of refrigerant leakage.

2. Selecting an indoor unit type

An indoor unit with an installation position 2 m or higher above the floor is recommended.

3. Restrictions on the tubing connections between living spaces

Tubing connections must be subjected to a reliable airtightness test after the completion of work. The test must conform to JIS-B-8607 (refrigerant flared and brazed joints).

4. Combined use of a ventilation system

- (a) Mechanical ventilation devices must be used in order to reduce the concentration of leaked refrigerant.
- (b) Mechanical ventilation devices which introduce outside air at a location 2 m or higher above the room floor are recommended.
- (c) The ventilation volume of the mechanical ventilation devices must be at or above the volume shown in Fig. 6, according to the amount of refrigerant gas and room volume.
- (d) Be sure to create openings that improve ventilation (such as the bottom gap of room doors).
- (e) The ventilation system must operate at all times, regardless of whether the A/C device is in use or not, and regardless of whether there are persons in the room or not. If this is not possible, a sensor system must be used to automatically operate the ventilation system when refrigerant leakage is detected.

5. Restrictions and precautions for tubing installation

- (a) Tubing must include earthquake-resistant support to prevent damage resulting from earthquakes or other external forces.
- (b) When adding support to the tubing, create relief in the axial direction to prevent the occurrence of thermal stress.

6. Flowchart showing refrigerant leakage measures: Omitted

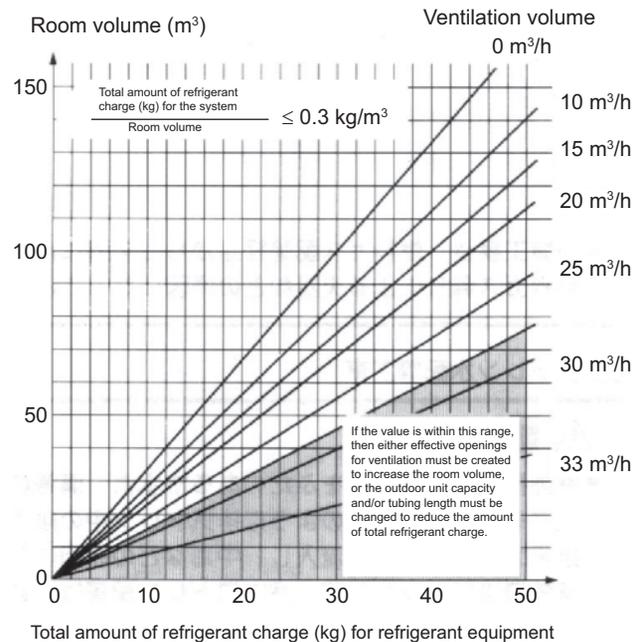


Fig. 6 Selecting a System According to Ventilation Volume

- If the following is true in Fig. 6, then ventilation devices with the indicated ventilation volume are required: $2/3 > \text{Total amount of refrigerant charge for the system} / \text{Room volume} > 0.3$
- The range indicated by in Fig. 6 is the range in which: $\text{Total amount of refrigerant charge for the system} / \text{Room volume} \geq 2/3$. If the value is within the range indicated by , either the room must be enlarged (for example, by removing a door connecting to the next room), or the outdoor unit must be reduced in size.
- For example, consider the case where a 2.8 kW indoor unit is installed in a 16.5 m², 2.7 mH room, and is connected to a single 56.0 kW outdoor unit. If 18 kg of refrigerant is added to the charge, the total charge is 17 + 18 = 35 kg.
 $35 \div (16.5 \times 2.7) = 0.79 > 2/3 (= 0.67)$
 Because this is within the range on the graph indicated by , either the room must be made larger or the outdoor unit must be reduced in size.

2. PRECAUTIONS FOR INSTALLATION WORK

(1) Foundation construction



WARNING

- The foundation for the outdoor A/C unit must be made of concrete or similar material, and must be sturdy and level, with good drainage. Failure to create a suitable foundation may result in the outdoor unit tipping over, causing gas leakage or personal injury.
- When installing the outdoor unit, be sure to use the specified size of anchor bolts (shown in Fig. 7) and anchor the unit security. Failure to do so may result in the outdoor unit tipping over, causing gas leakage and personal injury.
- Spread a vibration-resistant mat over the surface where the bottom of the outdoor unit contacts the ground, so that the load is applied evenly. Use rubber bushings and anchors in such a way does not diminish the vibration-resistant effects.

Foundation diagram (mat foundation)

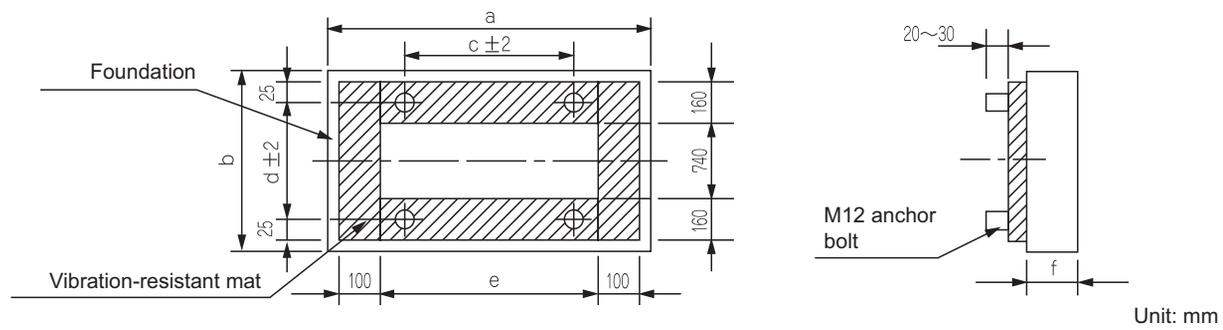


Fig. 7

Unit: mm

Table 3

		a	b	c	d	e	f
45.0/56.0/ 71.0 kW	Installation on ground	1,850 or more	1,150 or more	1,000	1,014	1,600	120 or more
	Installation on roof		Without vibration-resistant frame				1,450 or more
		With vibration-resistant frame (single type)	2,000 or more				1,600 or more

Unit: mm

- Be sure to take the following steps to prevent shifting of the foundation.
 - A mat foundation that is simply placed on a floor slab (A-a type) must be of the dimensions shown in the table above or larger in order to prevent shifting of the foundation in case of earthquake. If the mat foundation is smaller than these dimensions, take steps such as connecting the foundation and the building structure with reinforcing bars, in accordance with building utilities earthquake-resistant design and construction guidelines.
 - Foundation types A-b, A-c, A-d, and A-e are provided as examples.
- Use one of the following types of anchors. Use bolts of size M12 or larger for all bolts.
 1. Embedded-type: L-type, LA-type, headed bolts, J-type, JA-type
 2. Blockout-type: L-type, LA-type, headed bolts, J-type, JA-type (Make dimension "f" of the foundation 180 mm or more.)
 3. Plastic anchor
 4. External-thread type mechanical anchor

(Note) Do not use an internal-thread type mechanical anchor.

- If you wish to reduce the foundation weight when installing on a roof, use a light-weight foundation that utilizes a suitable steel frame (for more information, please contact sales office)
The light-weight foundation is in accordance with building utilities earthquake-resistant design and construction guidelines. For construction, follow the installation instructions from the manufacturer supplying the steel frame.

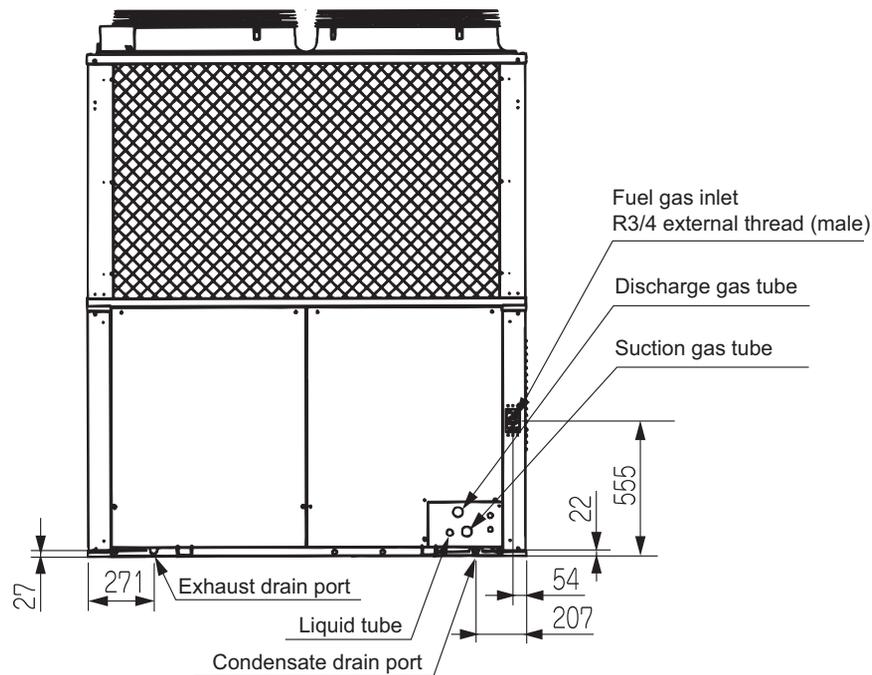


Fig. 8

(2) Fuel piping work

As needed, attach devices 1 to 5 to the outdoor unit external fuel gas pipe. (Fig. 9)

1. Flexible gas hose 2. Pressure release tap 3. Strainer 4. Master valve 5. Pipe bracket



- Use a reinforced gas hose or a low-pressure gas hose with fuel gas joint bracket between the fuel gas pipe master valve and the outdoor unit. In addition, avoid excess pressure or shock to the outdoor unit's fuel gas inlet by taking measures such as making the pipe path leading up to the gas hose as short as possible. Otherwise, there is danger of fire resulting from fuel gas leakage.
- If necessary, install pipe brackets in the fuel gas pipe path to reduce the risk of pressure or shock to the pipe path. In particular, take sufficient precautions when installing near roads. There is a danger of fire or explosion resulting from fuel gas leakage.
* In regions with heavy snowfall, take precautions to protect the fuel gas pipe path from snow damage (Fig. 10).
- After installation work is completed, check that there is no gas leakage from the fuel gas pipe/hose path. There is danger of fire resulting from fuel gas leakage.
- To ensure safety in case of a gas leak, make sure that airflow surrounding the outdoor unit is sufficient and gas will not accumulate. Accumulation of gas may result in fire or explosion.

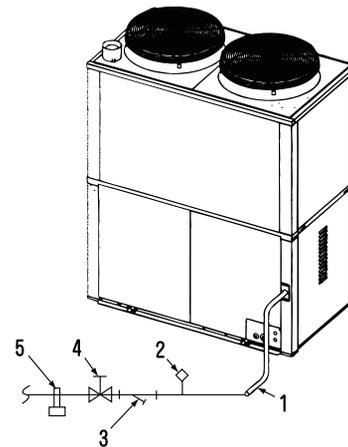


Fig. 9 Fuel Pipe Structure Diagram

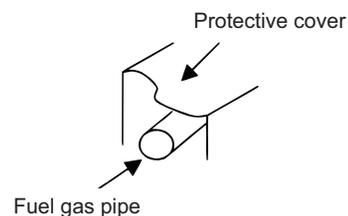


Fig. 10 Fuel pipe protection example

(3) Exhaust drain pipe work



- If connecting the outdoor unit's exhaust drain to a covered drainage basin or gutter, or draining multiple outdoor units to the same location, be sure to configure the pipes (as shown in Fig. 11) so that exhaust gases are discharged into open air. (Make sure that the opening in the receiving drain pipe is at least 50A in nominal diameter.) Exhaust gases flowing into the building or indoor/outdoor units may result in poisoning or corrosion of the unit.
- If a pipe is used for outdoor unit exhaust draining, do not use the same pipe for other purposes (condensate draining for outdoor units, indoor unit draining, etc.). Exhaust gases flowing into the building or indoor/outdoor units may result in poisoning or corrosion of the unit.



- If installing the outdoor unit on a roof, extend the exhaust drain pipe to the water drain (as shown in Fig. 12).
PROHIBITED: Do not install the drain pipes so they drain directly onto concrete surfaces, waterproof sheets, or metal roofing.
Doing so may result in discoloring of concrete and metal surfaces, damage to waterproof sheets, holes, and other damage.
- Slope the drain pipe at a gradient of 1/50 or more, and do not taper the pipe diameter (Fig. 11, 12). In addition, do not create any traps or peaks in the pipe.
- If connecting multiple outdoor units to a single exhaust drain pipe, be sure to prevent exhaust gases from flowing backward by allowing the gases to discharge into open air where the drain hose enters the drain pipe (with the drain pipe opening at least 50A in nominal diameter). Exhaust gases flowing back into the outdoor units while they are stopped may result in starting failures, engine stalls, corrosion of the unit, and other problems. In addition, take measures to prevent drain water from splattering in locations where wind is strong.
- In cold regions where the exhaust drain pipe is likely to freeze, wrap heat tape or take other measures to prevent freezing.
- Use PVC or stainless steel tubing for the exhaust drain pipe.
- As condensed water drips from the unit, be sure to install it in a location with good drainage. (Tubing for the condensate drain port (Fig. 8) is not necessary, but follow the above precautions if tubing is installed.)
* Condensed water from the refrigerant tubing inside the unit is released through the condensate drain port. Condensed water from the heat exchanger and water that gets inside the unit is released through the drainage ports located at the center of either side panel.

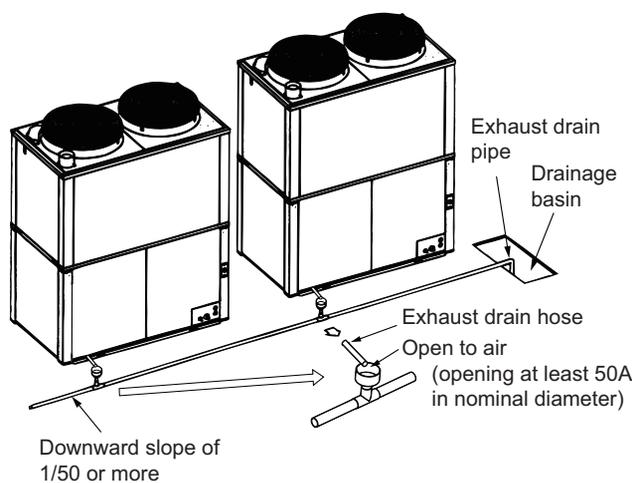


Fig. 11 Draining the exhaust into a drainage basin

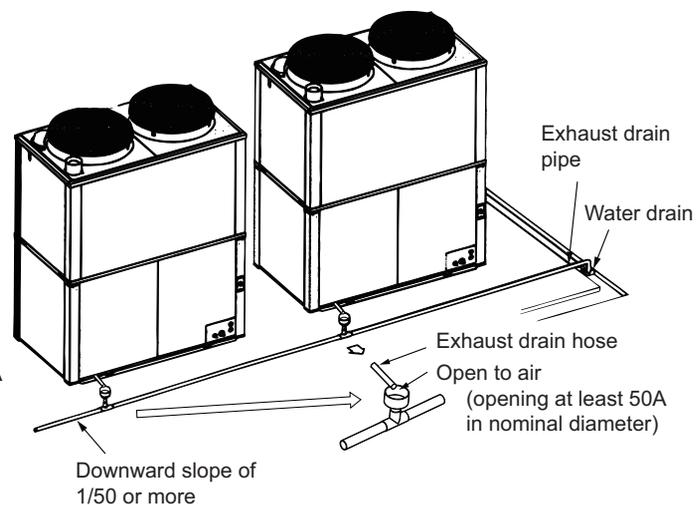


Fig. 12 Draining the exhaust into a water drain (roof)

3. INSTALLATION PROCEDURE

3-1. Anchoring the outdoor unit

Transporting the outdoor unit by hoist:

- For hoisting, pass the rope over the hoisting brackets on the unit vase at 4 locations. (Fig. 13)
- Insert wood separators as protective shielding when using the hoist to prevent the outer casing from being scratched or deformed by the rope. Be sure not to touch or apply pressure on tube connectors. (Fig. 13)
- When hoisting with a crane, the crane hook position must be 1 m or more above the unit.

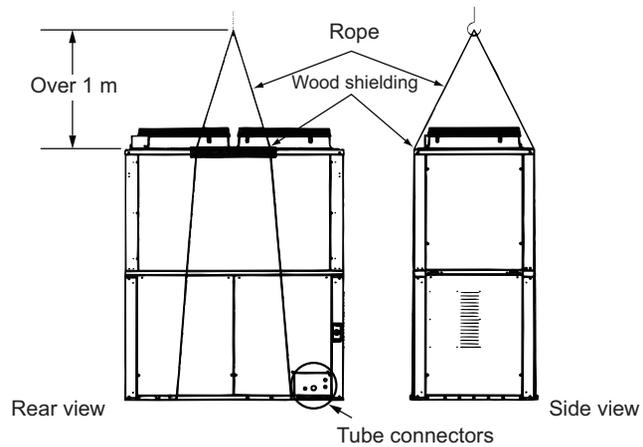


Fig. 13



CAUTION

- Do not lay the outdoor unit on its side during transportation. This can damage the devices and result in malfunction.

3-2. Preparing and installing the tubing

- Material: Phosphorous deoxidized copper seamless tubing (C1220T)
- Tube size: Use the correct size according to Table 4.

Table 4

Tube size (mm)		
Outer dia.		Thickness
φ9.52	(C1220 O)	T0.8
φ12.7	(C1220 O)	T0.8
φ15.88	(C1220 O)	T1.0
φ19.05	(C1220 O)	T1.2
	(C1220 1/2,H)	T1.0
φ22.22	(C1220 1/2,H)	T1.0
φ25.4	(C1220 1/2,H)	T1.0
φ28.58	(C1220 1/2,H)	T1.0
φ31.75	(C1220 1/2,H)	T1.1
φ38.1	(C1220 1/2,H)	T1.35

Discharge gas tube (medium)

Suction gas tube (wide)

Liquid tube (narrow)

Branch tube: Purchase separately.

Select tube sizes from Tables 2-1 to 2-3, and prepare the tubing.

- After cutting the tube, be sure to remove all burrs and finish tubing ends to the correct surface. (The same must be done for branch tubes (purchased separately).)
- When bending tubes, be sure the bend radius is at least 4 times the outer diameter of the tube.
- When cutting or bending tubes, be careful not to cause any pinching or blockage of the tube.

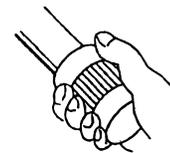


Fig. 14



CAUTION

- Prevent foreign substances such as dirt or water from entering the tube by sealing the end of the tubes with either a cap or with tape. Otherwise, this can damage the devices and result in malfunction.

3-3. Connecting the refrigerant tubing

1. Remove the gas tube and liquid tube fastening panel from the tube connection panel. Remove the fastening rubber.
2. Connect the tubes and perform brazing.
3. Reattach the gas tube, liquid tube fastening panel, and fastening rubber as they were originally.

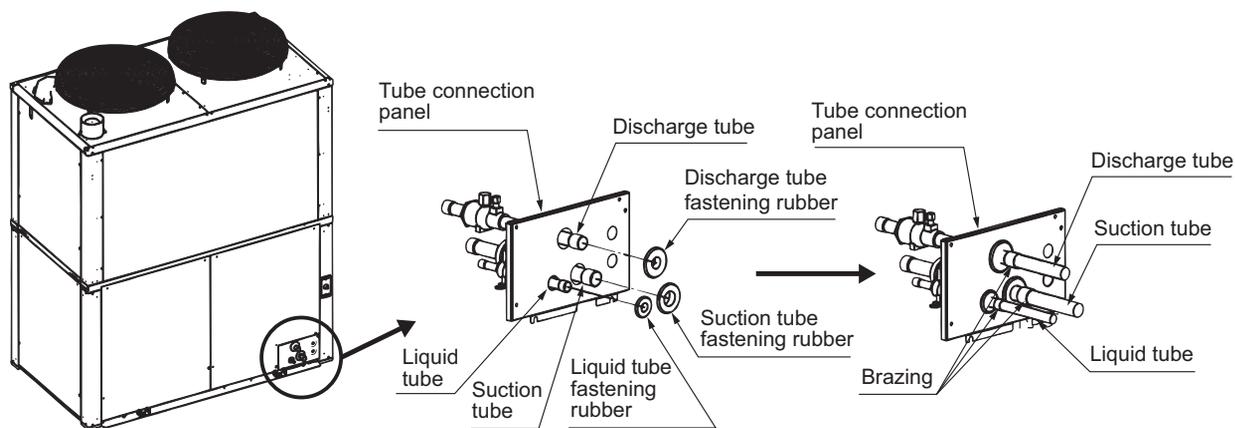


Fig. 15

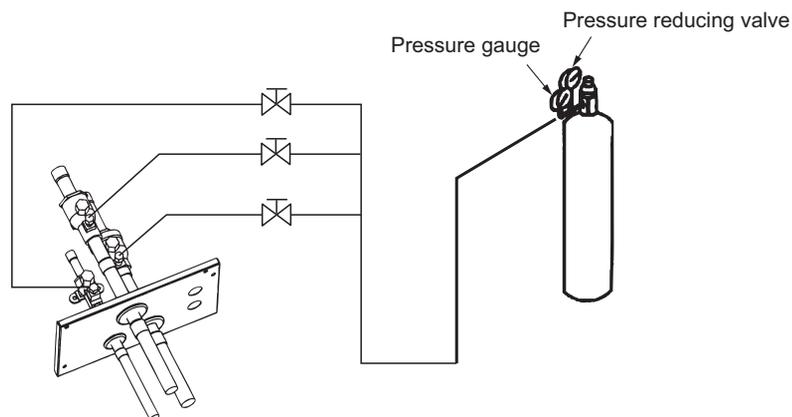


Fig. 16



Be sure to perform the following before brazing.

- The rubber that fastens the tubes is damaged easily by heat. Be sure to remove it before brazing.
- Cool the tubes with wet cloths or other materials to prevent the valve inside the machine from being damaged by the brazing heat.
- Be sure to replace the contents of the tube with nitrogen to prevent the formation of an oxide film.
- Do not use commercially available oxide film agents (antioxidants). They can adversely affect the refrigerant and the refrigeration oil, and can cause malfunctions.

If using flare connections (for the indoor connectors or other part), apply refrigeration oil to the flared part.

3-4. Tubing airtightness test and vacuum application

An airtightness test is required for gas heat pump A/C as part of industry installation guidelines. Follow the procedure below to perform the test and confirm there is no leakage from any connections.

- Connect the manifold gauge to both service ports - on the wide tube side and narrow tube size. Then connect the nitrogen tank, vacuum pump, and other items as shown in Fig. 17.
- When performing airtightness tests or creating vacuums, perform them for all service ports simultaneously. (All outdoor unit valves should remain closed.)
Always use nitrogen for the airtightness test. (Do not use oxygen, carbon dioxide, other refrigerants, etc.)
When performing the airtightness test for newly installed indoor/outdoor unit tubing, we recommend testing the tubes separately before connecting them to outdoor units.

CAUTION

The service ports are check valves.



CAUTION

Use nitrogen to raise the pressure to the airtightness test pressure (4.15 MPaG) and confirm that there is no leakage. Refrigerant leakage can cause suffocation and injury to nearby persons.

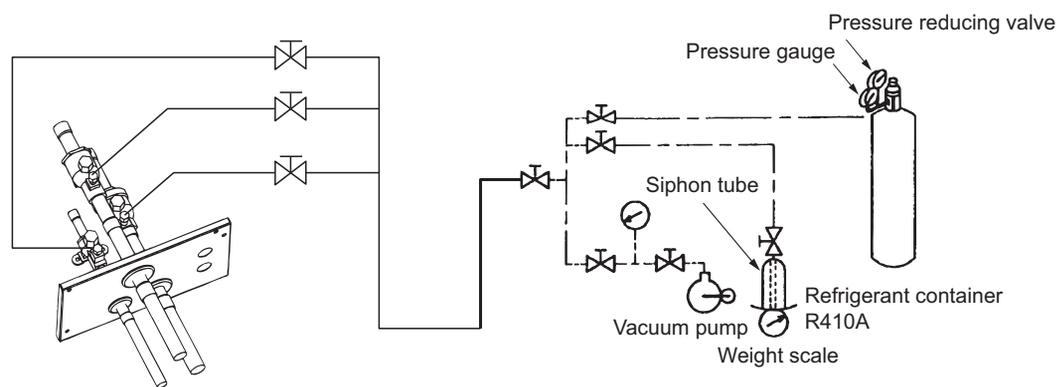


Fig. 17

- After the airtightness test is completed, apply vacuum of 667 Pa (-755 mmHg, 5 Torr) or below to the indoor unit and tubing.
- Do not leave for a long period of time after the vacuum state has been reached.

3-5. Refrigerant charge

Calculation of amount of additional refrigerant charge

(1) Table 6 shows the refrigerant charge at factory shipping time. Additional refrigerant must be added according to the size and length of the tubing (calculated from the size and diameter of the liquid tubing using the values in Table 5).

Table 5 Quantity of additional refrigerant charge

Liquid tube size (mm)	Additional charge quantity per meter (g/m)
φ 9.52	56
φ12.7	128
φ15.88	185
φ19.05	259

Table 6

Model No.	Quantity of refrigerant charge when shipped (kg)
Type 150	11.5
Type 190	
Type 240	

Required additional refrigerant charge (g)	$= 259 \times (A) + 185 \times (B) + 128 \times (C) + 56 \times (D) +$ Unit additional charge amount (E)
--	---

Table 7

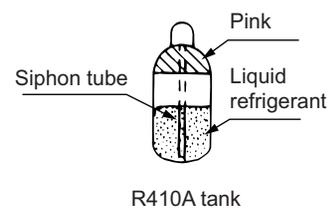
- (A) = total length in meters of 19.05 mm diameter liquid tubing
- (B) = total length in meters of 15.88 mm diameter liquid tubing
- (C) = total length in meters of 12.7 mm diameter liquid tubing
- (D) = total length in meters of 9.52 mm diameter liquid tubing
- (E) = Unit additional charge amount (Table 7)

Model No.	Unit additional charge amount (kg)
Type 150	8.5
Type 190	
Type 240	12.5

- (2) Be careful to charge accurately according to refrigerant weight.
- (3) Charging procedure
 - Evacuate the system, close the gauge manifold at the gas tube side to ensure that no refrigerant enters the gas tube side, then charge the system with liquid refrigerant at the liquid tube side. While charging, keep all valves fully closed.
 - The compressor can be damaged if liquid refrigerant is added at the gas tube side.
- (4) If the system does not accept the predetermined quantity of refrigerant, fully open all valves and run the system (either heating or cooling). While the system is running, gradually add refrigerant at the low pressure side by slightly opening the valve on the cylinder just enough so that the liquid refrigerant is gasified as it is sucked into the system. (This step is normally only needed when commissioning the system.) All outdoor unit valves should be fully open.
- (5) When charging is completed, fully open all valves.
- (6) Avoid liquid back-flow when charging with R410A refrigerant by adding small amounts at a time.

Notes

- When charging with additional refrigerant, use liquid only.
- R410A cylinders are colored gray with a pink top.
- Check whether a siphon tube is present (indicated on the label at the top of the cylinder).
- Depending on refrigerant and system pressure, conventional refrigerant (R22, R407A) equipment may or may not be compatible with R410A equipment, so care is needed. In particular, the gauge manifold used must be specifically designed for R410A.
- Be sure to check the limiting density.
- Refer to the section “4. OPENING THE CLOSED VALVES” when the instructions call for fully opening all valves.

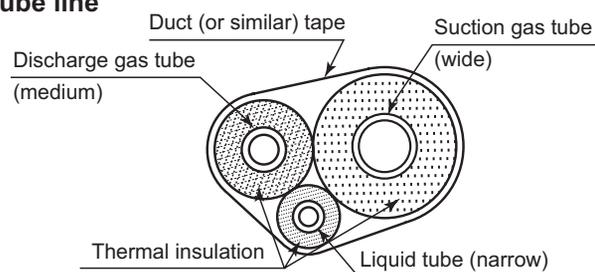


3-6. Finishing the outer tubing covering



- Apply thermal insulation to all tubing, including branch tubes. Make sure that there are no gaps or openings in the thermal insulation that may allow moisture to enter. Use thermal insulation that can withstand a minimum of 120°C for the gas side (wide tube system), and a minimum of 80°C for the liquid side (narrow tube system). Failure to do so can result in water leakage and dripping condensation, leading to wall discoloration, puddling, etc.
- Use separate piping for the power cables and the control cables. If the cables are passed through the same pipes, the effects of electrical noise and induction can cause malfunctions.

● 3-tube line



● 2-tube line

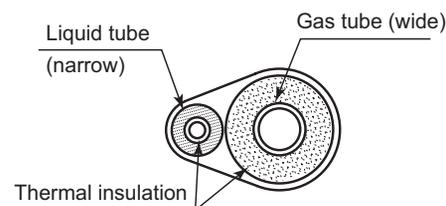


Fig. 18

4. OPENING THE CLOSED VALVES

Ball valves are used for the closed valves on the outdoor unit. Each can be opened and closed by rotating the tab 90 degrees.

Follow the procedure below to securely open the valves.

1. Remove the cap.
2. Slowly and securely turn the tab to the left (counterclockwise) 90 degrees. (Same for both the gas and liquid sides.) The valve is fully open when the tab has been rotated 90 degrees (when it contacts the stopper). Do not forcefully attempt to turn the tab past this point.

CAUTION

Be sure to open the closed valve all the way.

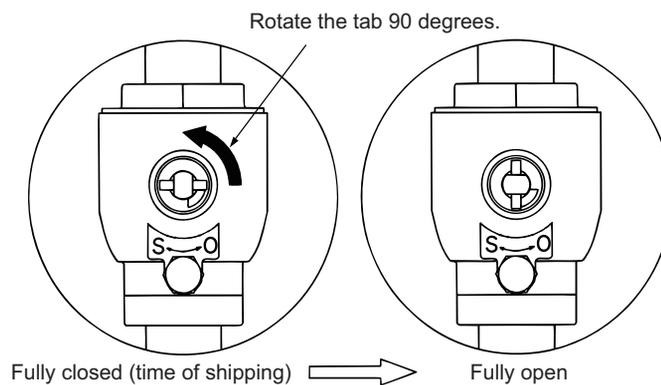


Fig. 19 Rotating the Tab

3. Attach the stopper ring securely to the liquid side (narrow tube) and gas side (wide tube). Then reattach and tighten the cap.

- Cap tightening torque

Liquid side (narrow tube) <5/8", 3/4">	13 N·m
Suction gas side (wide tube) <1-1/2">	30 N·m
Discharge gas side (medium tube) <1">	35 N·m

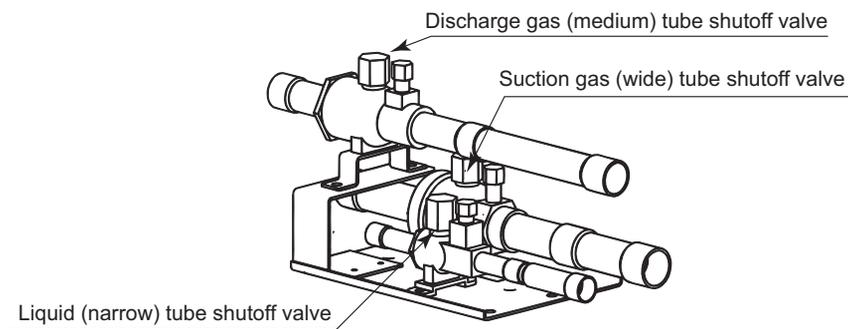


Fig. 20

5. AFTER INSTALLATION IS COMPLETED

- Record the actual length of refrigerant tubing and the amount of refrigerant charge. With the outdoor unit, the “label for showing the actual length of refrigerant tubing and the amount of refrigerant charged” is provided. Enter the details in the designated spaces, and apply the label to the inside of the electrical box panel, at the top.

**This will be needed for subsequent maintenance.
Be sure to enter this information and apply the label.**

6. ENGINE REPLACEMENT PATHWAY

- During installation, consider the engine external dimensions listed at right and ensure that there is a sufficient pathway for moving the engine. This pathway will be required should the engine need to be replaced.

Table 8

Type	Engine external dimensions (mm)			Package weight (kg)
	Width	Depth	Height	
45.0/56.0/71.0 kW	670 (1000)	640 (900)	650 (720)	170

*Figures in parentheses are the external dimensions of the wood shipping crate.

7. USING A VIBRATION-RESISTANT FRAME

- A vibration-reduction frame must be used if the unit is installed in locations where noise and vibration can be a problem, such as on rooftops above living spaces or conference rooms. If a vibration-resistant frame is used, be sure to install steady braces or other support, and take measures to prevent applying excessive force to the refrigerant tubing.
- When anchoring the refrigerant tubing, place the tubing anchor at least 1.5 m away from the outdoor unit, as shown in Fig. 21.
- When installing the vibration-resistant frame, refer to the instruction manual provided by the manufacture of the vibration-resistant structure.

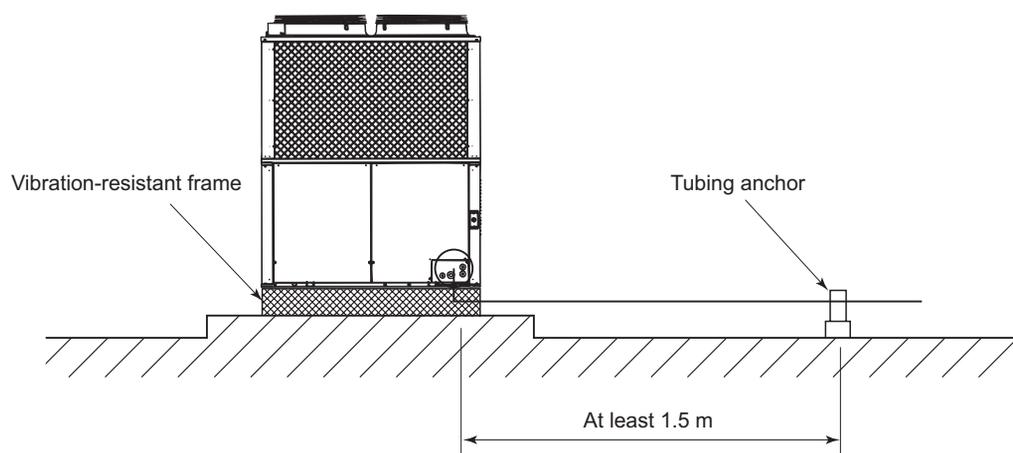


Fig. 21

Procédures et points techniques concernant l'installation du système

SANYO

Le présent document a été spécialement conçu pour l'installateur responsable du montage de ce système de climatisation, qui devra lire attentivement chacune des instructions avant de procéder.

Modèle applicable : Unité extérieure, modèle SGP-M2

Nouveau frigorigène R410A

- Jointes à l'unité extérieure, vous trouverez également des instructions sous la forme de deux documents : « Procédures et points techniques concernant le travail de câblage électrique (extérieur) » et « Procédures et points techniques concernant les essais de fonctionnement ». Veuillez à les consulter.

IMPORTANT !

Veuillez lire ce qui suit avant de procéder

Ce système de climatisation répond à des normes strictes de sécurité et d'exploitation. En tant qu'installateur ou préposé à l'entretien, il est de votre devoir d'installer ou de dépanner le système en vue d'un fonctionnement sûr et efficace.

Pour une installation sûre et un fonctionnement sans problème, conformez-vous aux points suivants :

- Lisez attentivement toutes les instructions avant de procéder.
- Suivez à la lettre chacune des phases d'installation ou de réparation.
- Respectez tous les codes électriques locaux, régionaux et nationaux.
- Faites très attention aux avertissements et consignes de prudence qui figurent dans ce manuel.



AVERTISSEMENT

Ce symbole signale un danger ou une manœuvre périlleuse pouvant engendrer des blessures physiques graves, voire mortelles.



ATTENTION

Ce symbole signale un danger ou une manœuvre périlleuse pouvant engendrer des blessures physiques ou des dégâts matériels.

Le cas échéant, demandez de l'aide

Ces instructions sont tout ce dont vous avez besoin pour la plupart des sites d'installation et des conditions de maintenance. En cas de problèmes spécifiques, demandez de l'aide auprès de votre point de ventes ou centre de services, ou adressez-vous à votre revendeur agréé pour de plus amples consignes.

En cas d'installation inadéquate

En aucun cas, le fabricant ne saurait être tenu responsable d'une installation ou d'un service de maintenance inadéquats, notamment si cela est dû au non-respect des instructions du présent document.

PRÉCAUTIONS SPÉCIALES

AVERTISSEMENT Lors du câblage



TOUT CHOC ÉLECTRIQUE PEUT ENGENDRER DES BLESSURES PHYSIQUES GRAVES, VOIRE MORTELLES. SEUL UN ÉLECTRICIEN QUALIFIÉ ET CONFIRMÉ EST HABILITÉ À PROCÉDER AU CÂBLAGE DU SYSTÈME.

- Veillez à ne pas brancher l'appareil au secteur tant que l'ensemble du câblage et du raccordement de la tuyauterie n'est pas terminé ou reconnecté et vérifié.
- Ce système fonctionne sous des tensions électriques extrêmement dangereuses. Consultez le diagramme

approprié et les présentes instructions au moment de procéder au câblage. Des branchements mal effectués et une mise à la masse inadéquate peuvent être à l'origine d'accidents entraînant des blessures graves, voire mortelles.

- Mettez l'appareil à la masse conformément aux codes électriques locaux.
- Branchez tous les câbles solidement. Un câblage trop lâche peut entraîner une surchauffe au niveau des points de connexion et être à l'origine d'un éventuel incendie.

Lors du transport

Faites très attention à ce que vous faites lorsque vous levez et déplacez les unités intérieures et extérieures. Demandez à quelqu'un de vous aider, et pensez à plier les genoux pour diminuer les efforts sur votre dos. Le climatiseur présente quelques bords tranchants ou de fines ailettes en aluminium pouvant couper les doigts.

Lors de l'installation...

...Au plafond ou au mur

Assurez-vous que le plafond ou le mur est suffisamment solide pour pouvoir supporter le poids de l'appareil. La construction d'un cadre en bois ou métallique robuste peut s'avérer nécessaire pour un meilleur soutien.

...Dans une pièce

Isolez correctement l'ensemble de la tuyauterie à l'intérieur d'une pièce pour éviter tout suintement ou écoulement d'eau pouvant endommager les murs et les sols.

...Dans des lieux humides ou sur des surfaces accidentées

Installez l'unité extérieure sur de solides fondations, bien régulières, que vous aurez construites sous forme d'un socle cimenté ou à l'aide de parpaings, pour empêcher les dégâts des eaux et les vibrations inhabituelles.

...Dans une région très ventée

Stabilisez l'unité extérieure à l'aide de boulons et d'un cadre métallique. Installez une chicane d'air.

...Dans une région à fort enneigement (systèmes avec thermopompe)

Installez l'unité extérieure sur une plate-forme surélevée plus haute que le niveau habituel de neige. Prévoyez des systèmes d'aération.

Lors du raccordement de la tuyauterie pour l'écoulement du fluide frigorigène

- Soudez les tuyaux au chalumeau.
- Appliquez du lubrifiant réfrigérant sur les surfaces correspondantes des tuyaux mandrinés et des raccords-unions avant de les assembler, puis serrez solidement l'écrou à l'aide d'une clé dynamométrique pour garantir l'étanchéité.
- Vérifiez qu'il n'y a pas de fuites avant de démarrer tout essai de fonctionnement.

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